for VICTORY .... Work Harder .... Stop Waste .... Buy Bonds

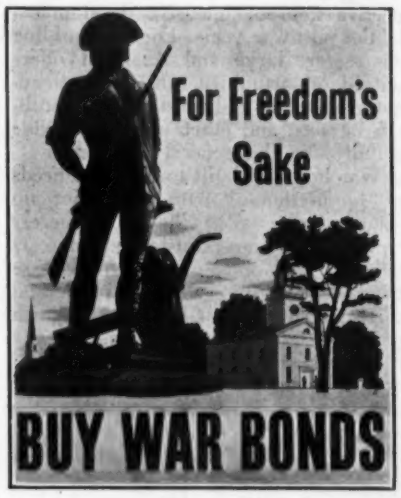
Contractors and Engineers Monthly

Vol. 40, No. 8 AUGUST, 1943 $2 a Year, 20 Cents a Copy

Highlights Of This Issue

- **Doubling Up on Runway Job** Two cranes at the batching plant and two 27-E pavers on the subgrade speeded the concrete paving of 150 x 5,500-foot runways at an Army Air Field in the middle west. See page 1.
- **Post-War Planning** The great opportunities for basic improvements in the municipalities of this country, the provision of employment as a result of municipal public works, how such work should be financed, the prospects in the housing field, and the importance of starting designs for such work *now* are discussed in the fifth of our series on planning for post-war construction. See page 2.
- **County Road and Bridge Work** Asphalt sealing of roads in Ada County, Idaho, and its program of bridge work by county crews are discussed in this issue, which also contains a description of how Auglaize County, Ohio, rebuilt an obsolete bridge by using scrap, welding, and ingenuity. See pages 2 and 47.
- **Wood-Pile and Concrete Dam** An unusual water-supply dam, consisting of sheet piling and wood-pile bents with a concrete deck, resulted from the wartime scarcity of critical materials and the urgency for an increase in the water supply for a vital war-industry area. See page 13.
- **Highway Maintenance** A program of oil-mat and chip-seal road work by state maintenance crews in Colorado is described in this issue, which also contains an account of war-time maintenance in Massachusetts. See pages 15 and 38.
- **Care of Equipment** Continuing our series on the care of various types of construction equipment, we discuss the proper and regular care of power shovels. Also in this issue is a description of how the mechanics kept the hard-working machines on the Alaska Highway on the job, in spite of tough conditions and lack of spare parts. See pages 17 and 23.

IN THIS ISSUE



Super-Elevation Replaces Crown

Slab of Traffic Circle Raised by Mud-Jacking To Reduce Accidents at New Jersey Intersection

By F. D. WOODRUFF, Assistant Superintendent of Maintenance, New Jersey State Highway Department

✦ AN interesting Mud-Jacking operation was performed recently by the New Jersey State Highway Department on the rotary traffic circle located at the intersection of New Jersey State Highway Route 25 (U. S. Route 1) and New Jersey Route S-28, in the vicinity of New Brunswick. The problem with which the Department was

(*Concluded on page* 55)

Twin Pavers Speed Pouring of Runways At Midwest Field

Double the Equipment and You Speed the Job Was the Thought Behind Important Air Field Contract

✦ TWO cranes to serve the batching plant, a fleet of ten 2-batch trucks on a short haul, and two pavers to pour the concrete between the forms made the runway paving hum at a big training center for Air Force personnel in the midwest. The average speed over the entire contract had been only 1,000 feet in 8 hours, due to many tie-ups caused chiefly by sudden storms throughout the summer. However, much better than 125 feet per hour of 25-foot slab with an 8-6-6-8-inch section was attained during the period when the Air Corps was making preparations for special training on these runways. The runways are 150 feet wide and 5,500 feet in length.

Batching with Twins

All of the rock and sand for the concrete were trucked in a distance of 25 miles while the bulk cement came in by rail. The aggregates were a graded crushed limestone and a sand that proved to be somewhat harsh, requiring the addition of 14 pounds of fly ash to each batch to prevent bleeding of the mixing water.

The batching was done by a Johnson weighing batcher plant set between the two stockpiles of stone and sand. One Koehring crane with a Blaw-Knox 1-yard clamshell bucket handled the stone while another similar outfit pushed up the sand to the hopper. In spite of batching for two pavers, there was only one batch man who was kept busy every minute by the fleet of ten 2-batch trucks that worked on the short hauls, to say nothing of the larger fleet that handled the long runs.

The Butler bulk-cement plant picked up the cement from the hopper beneath the track and stored the cement in a 300-barrel bin above the weighing batcher. One man ran the unloading equipment and another did the batching. As the trucks moved from the aggregate batching plant toward the cement plant, they stopped for two men to put in the 14 pounds of fly ash. Beyond the cement plant the trucks stopped again for a man to cover the cement with some of the sand to protect it against being blown off the batch.

Preparing for Paving

The rough grade was dressed by a power grader which also cut the form trench. One man set the line for the forms and then two form setters placed the Blaw-Knox forms while a third tightened the keys. The subgrader running on the forms to cut the final grade for the thickened edge somewhat disturbed the forms so they were realigned by one man and two helpers. On this contract the thickened edge reduced from 8 inches to 6 inches in 3 feet from the forms on each side.

The expansion joints, set by the two steel men, were spaced 120 feet apart and at the intersections of the runways. The expansion material was ¾-inch thick and set with a 2-inch equal-leg cap and with the joint broken at the middle of the slab and at the points of change from 6-inch uniform thickness to the thickened section 3 feet from the edge. The dowels for transferring the load from one slab to the next were ¾-inch round dowels 18 inches long with a crimped cap over the greased end of the dowel. The caps were 3 inches long and crimped to allow for ½ inch movement of the dowel. There were 13 dowels in each half of the joint. A ¾-inch rod along the top of the pressed-metal frame for holding the dowels in line also kept them spaced properly. The joint was held firmly in place during the pouring of the concrete by two sets of double pins for each half and an extra set at the center where the two parts join. Additional security was

(*Concluded on page* 33)

CONCRETE GOES TO SEA

Following closely on the heels of Belair No. 1, the second reinforced-concrete barge has been launched at Belair Shipyard. Barrett & Hilp, general contractors, have the contract for twenty-six of these sea-going barges. See page 7.

Post-War Work in Cities

Streets, Subways, Sanitation, and Utilities; Municipal Financing, and Housing Plans

Great Opportunities in Wide Variety of Fields Where Cities Take Lead In Post-War Planning

✦ THE post-war decade represents the greatest opportunity in the history of this country for the development of American municipalities along well-conceived lines planned in accordance with the wealth of technical and sociological knowledge available today. The depression era found cities lost in a sea of hastily conceived schemes and grasping for crumbs from the White House table to maintain economic life. If the 3,464 cities of over 2,500 population and the 13,288 incorporated municipalities of less than 2,500 population are to maintain their economic and governmental independence, they must regard the present period of history as an opportunity to start the creation of better communities for the future.

An increasing number of thinkers on the subject of post-war planning, as well as the Committee for Economic Development working with business through Chambers of Commerce in all cities, are urging that post-war planning start from the bottom, in the cities and towns, in the small businesses as well as the large. This means the preparation of plans, specifications, and contracts, not just nebulous, hopeful thinking; it means providing the cash for preparing the designs as well as for financing actual construction. Municipalities cannot afford to wait for the beneficent higher-ups to tell them what to do. That will make the projects cost more in the end, and the cities will lose their independence of thought and action. WPA and PWA with their entangling red tape are not too far away to have lost their value as horrid examples of "letting Uncle Sam do it".

In the paragraphs below we aim to outline the breadth of post-war municipal planning which will increase the volume of public construction in the post-war decade. As to total dollar volume we cannot report, for no national agency has as yet estimated or hazarded a guess at the size of the municipal program. It can be vast and well distributed because it can be spread over the entire country in every community so that contractors will be able to find work near home. It then behooves every construction group to aid in the formulation of definite plans, blueprints, and contracts ready for letting in its own city and region so that municipal post-war construction will rise from the grass roots and not come as Federally controlled manna from above.

(*Continued on page* 10)

C. & E. M. Photo

New sewage plants, water works, and other municipal facilities, if plans are prepared now, will provide many jobs in the post-war period.

City Financial Condition Poor, Many Will Seek Aid From State or Nation; Few Have Strong Cash Position

✦ THE question of financing a large potential volume of post-war work is of paramount importance. The volume of taxes which cities can levy on real estate has about reached its economic limit; hence many city officials feel that funds for post-war construction cannot be secured from taxation. This condition, plus the tendency to seek Federal aid, stimulated by the handouts of the '30's in the form of grants and long-term loans under PWA and outright gifts under WPA, has created the habit of looking to the state or Federal government rather than in the local pocketbook for funds to carry on municipal projects.

(*Continued on page* 40)

The Market for Housing As Government Projects And Privately Financed; Handling Slum Clearance

✦ THERE is a consensus of opinion that housing will contribute $10,000,000,000 a year to construction for at least 5 years, if not a decade, after the war. The lack of construction during the depression, followed by the stoppage of residential construction for new families during the war, has made this a prospective field of intensive development in the post-war years. For the building contractor, large and small, it offers untold opportunities, while the attendant grading for and construction of utilities, streets, and other work offer wide activity for the general contractor.

War housing, built to meet the needs of population growths that shot up "like asparagus in May", is merely temporary. Some enthusiastic promoters tried to "sell" some of these projects as permanent additions to the residential facilities of the war-boom cities, with perhaps some slight changes. Already it is realized that the millions expended on war housing was for construction only little more permanent than the great trailer camps. Those cities which expect to retain war-born industries after the conflict must provide more permanent structures for our peace-loving people who desire a higher standard of living, more comforts, and some luxuries in the dwellings they call home.

The Housing Market

To approach the housing market properly, we must consider what effect World War I and the depression had on housing. "Markets After the War," a study by S. Morris Livingston, Bureau of

(*Continued on page* 48)

Ramp Garage-Shop Serves Highway Dept.

Missouri Has Two-Story Brick Building Located At Jefferson City; Full Service for Equipment

(*Photos on page* 60)

✦ LOCATED in the heart of Jefferson City, below the imposing State Capitol, is a well-planned two-story ramp garage and service shop for the maintenance of Missouri State Highway Department motor equipment. The ground floor, where storage facilities are provided for a large number of cars, has also the office of the Garage Superintendent and the Service Man, and the very complete Parts Department which regularly carried an inventory of $250,000, as compared to the $10,000 stock of the shops for the Division garages which it supplies. Above are the shops for equipment repair, reached by a concrete ramp.

The Repair Shops

The business end of the garage is in the repair department on the second floor where every possible provision is made for the care of equipment, as well as the other services of the highway department. For example, here in the northeast corner is the sign shop where old metal signs are sand-blasted to remove the old paint and then are repainted and marked, dried, and stocked for future use. The Pangborn sandblast is an effective machine which makes it possible for one man to operate it with full protection and without the need for aspirators, masks and complicated dust-prevention equipment, as they are all built right into the machine. A small Chicago-Pneumatic air compressor and an additional unit of the machine makes recovery of the air-blasted sand continuous for re-use.

Wood signs of redwood are made here

(*Continued on page* 34)

C. & E. M. Photo

The main entrance to the Missouri State Highway Headquarters Garage at Jefferson City. The gate at the right admits trucks to the stock room.

The county bridge crew replaced this old unsafe wood structure over Indian Creek, Ada County, Idaho, with the steel bridge shown below.

Extending Service Of Oil-Mat Roads

Asphalt Sealing Program In Ada County, Idaho, Is Curtailed at Present; Large Mileage Bladed Regularly

(*Photos on page* 60)

✦ TO insure a maximum life for its oil-mat roads, Ada County, Idaho, under its active County Engineer, C. L. Varian, has included the sealing of a portion of its roads every year as a part of its regular maintenance program. The mileage of bituminous mat has been extended each year since the present program was started in 1939, but the difficulties of transportation eliminated further mat construction in 1942 and limited the maintenance sealing to 10 miles. Ada County has an area of 1,154 square miles and 786 miles of county roads in the following classifications:

Unimproved	131.9 miles
Graded only	44.8 miles
Graded and drained	68.7 miles
Sand surfaced with clay binder	218.5 miles
Crushed-gravel surface	213.9 miles
Bituminous surface, mostly oil mat	107.8 miles
Total	785.6 miles

All bituminous-surfaced roads are 18 feet wide with 3-foot shoulders on either side. While the sealing operation is the most important to provide all-weather highways, the largest part of the county road work at present is blading the large mileage of roads with low-grade surfacing. A fleet of 25 trucks hauls gravel. These are 1½-ton Ford and Chevrolet dump trucks, with two 4-ton and one 5-ton Internationals. The county graders are all diesel-powered, minimizing the refueling problem, and include one Adams, one Caterpillar No. 11, one Caterpillar No. 112, one Warco, and, because a large area of the county is a newly developed suburban section adjacent to Boise with many stub streets, a small Allis-Chalmers power grader which has proved very serviceable because of its short wheelbase.

The Sealing Method

Prior to any sealing operation, and in accordance with the best practice, the old road is patched and brought

(*Continued on page* 18)

This 112-foot span over Indian Creek was originally part of the Boise River Bridge near Star in southwestern Idaho.

Your post-war road or street program

A series of advertisements pointing out how TEXACO Asphaltic products can fit into your program

#5

TEXACO

ASPHALT
PENETRATION
MACADAM

TEXACO Asphalt Macadam is an ideal heavy-duty pavement where satisfactory stone is available. Small photo shows this type of TEXACO construction on U. S. Highway No. 1 in Connecticut.

Where satisfactory stone is available an ideal heavy-duty pavement for street, highway or airport is TEXACO Asphalt Macadam.

With as little equipment as an asphalt distributor, roller and trucks, you can construct a TEXACO Asphalt Macadam pavement which will stand up under hard wear for years with little upkeep. Because so little equipment is required, this type is an economical choice for small as well as large projects.

Briefly, this is how it is constructed: Coarse broken stone is spread and rolled on the foundation to the desired thickness. Hot TEXACO Asphalt, applied by pressure distributor, penetrates the voids and acts as a binder to the interlocking stone. An application of ¾-inch stone is then rolled into the voids. This is followed by a seal coat of TEXACO, covered with fine aggregate and rolled, to form a durable, resilient pavement, impervious to surface water.

Where service cuts become necessary in a TEXACO Asphalt Macadam pavement, repairs are easily and speedily made at low cost.

In addition to TEXACO Asphalt Cement, Asphalt Macadam also is laid with excellent results using TEXACO Emulsified Asphalt and TEXACO Cutback Asphalt.

If you have a convenient source of trap rock or hard limestone, sandstone or slag, TEXACO Asphalt Macadam merits serious consideration in your plans for post-war street, highway, or airport construction. TEXACO Engineers, specialists in Asphalt construction, are at your service.

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Planning for Post-War Public Works Is Your Job and Should Be Done Now

The term "post-war planning" has been bandied about very freely in the past few months, in the newspapers, in speeches, in the technical press. This publication has devoted considerable space in each issue since last April to a discussion of post-war planning in the construction industry, and in this issue we take up planning for post-war work in the municipal field. However, as we survey the situation to see what actually has been done in the way of planning, we have come to feel that the term "post-war planning" was a very bad choice, as it seems to have suggested to most people an interesting topic for discussion now, with the planning done in the post-war period. There has been so little real planning, and by planning we in the construction industry mean the preparation of plans and specifications, of designs and blueprints, the acquisition of land and the proposals ready for bids, that the prospects of a sound well-conceived program of useful public works ready to be let during the difficult and perhaps economically chaotic reconversion period grow more and more dim and remote.

But what, you may ask, can we do about it? Some of you are the contractors who must wait until bids are called for, others of you are more deeply concerned right now with the maintenance of our present highway system, to keep it fit for heavy wartime traffic.

The most rational and businesslike plans for meeting the post-war problems have this fundamental principle in common, that they must begin at the grass roots, that cities, counties and states, as well as the Federal government, must share in the responsibility and initiative in the preparations for averting economic catastrophe in the reconversion period.

Speaking before the Governing and Advisory Boards of the Associated General Contractors of America in Chicago recently, G. Donald Kennedy, Vice President, Automotive Safety Foundation, and Chairman, Post-War Construction Committee, American Society of Civil Engineers, stated clearly and succinctly what each and every one of us can do.

Mr. Kennedy said, "There's a job of local leadership critically needed in every city right now. You men can and must rouse yourselves and other civic leaders in your home towns. Because, I tell you in all seriousness, if our cities are not ready with detailed plans, with legal and land obstacles overcome, with proposals for bids all ready, there is every indication that road-building and other public works jobs in our cities and states will be done on a direct make-work basis after the war—another wasteful hodge-podge that threatens our proven system of competitive bidding, and our proven Federal-state highway relationship.

"Talk to the business men, the industrialists, the newspaper editors, the labor leaders, in your own community. Go down to City Hall. See that the mayor and city planners understand the urgency of getting down to business—of drawing blueprints and acquiring land and putting the city's finances in shape. Give your local officials help and support. You construction men know the advance planning problems. Tell your mayor, your civic leaders, and your neighbors about them. Get the whole community behind the need for winning the peace right in the home town.

"This job is too big for Washington, or any state, or any small group of cities to do alone. See that the county, and the park district, and the state highway people, and all the taxing bodies, are brought together to agree on a coordinated program of street and highway improvements, including a ring of publicly owned parking lots in the blighted fringe around the city's downtown district. . . .

"There is only one way we can guarantee that the proven principle of competitive bidding for public works programs, and the proven value of Federal-state highway financing, and the proven merit of civilian government operating civil public works, will be continued after this war.

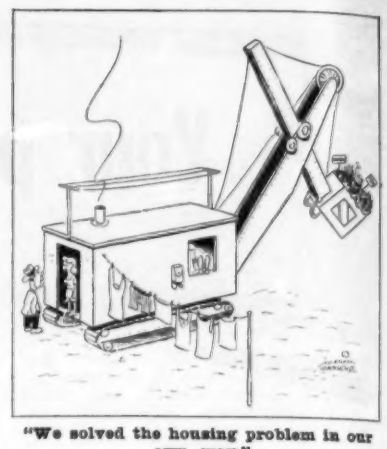
"That way is to see that our cities and our counties and our states get together right now to make advance preparations, in final detail, for a public works program involving $40 per capita for one year. And the way to do it is to encourage democratic planning right at the grass-roots level. No central agency in Washington can do that job and do it right. But if *we* fail, in our home towns, to be ready for the end of the war, I can tell you that some central agency in Washington *will* step in and try to do the job—and our citizens will accept that federalization, because it will be the logical and inevitable result of our local failure to be ready with useful public works."

Fighting Engineers Stage Demonstration

As part of its recruiting drive for 100,000 trained technicians and construction men for service in the Corps of Engineers, a huge 2-day demonstration of their varied activities was staged at Orchard Beach, New York City, July 24 and 25.

An exhibit of Engineers' tools and equipment to delight any mechanic or machine operator included a small Caterpillar tractor and LeTourneau bulldozer, a Clark tractor and bulldozer, a tractor with a hydraulic-operated 3-yard scraper, all for air-borne engineer troops; a radio car with two walkie-talkie units; a 2-wheel trailer with an air compressor; a truck with small air tools such as a Thor jackhammer with drill steel, tamper, and clay spades, a Reed-Prentice timber saw, an air-driven hand saw, a riveting hammer and a greasing outfit; pulled and power graders; and a complete machine shop on a 5-ton truck which carries a small lathe, drill press, acetylene and oxygen tanks and cutting and welding tips, a buffer and grinder, a Power-Packer hydraulic press, and a stock of parts for general repairs, as well as a good assortment of hand tools; and a portable electric welder on a 2-wheel trailer.

The largest single exhibit was the Reproduction Train, a group of seven trucks and trailers comprising a complete litho reproduction outfit from camera to completed map or piece of propaganda literature, all done in this unit in the field, isolated, insulated, gas-proofed, blacked out, and air-conditioned or heated as season or climate requires. Assigned to this unit are sufficient trucks to haul stock, supplies, and the less than 100 personnel and equipment for work and combat. Two of the trailers have their own generating units, but there are two additional 2-wheel trailers with gas-engine-driven generators, two 500-gallon 2-wheel tank trailers for water for processes, and two jeeps. Aerial photos dropped from planes are developed,. enlarged, processed into maps, and delivered in an incredibly short time. The complete Reproduction Train moves over the road at 30 mph and can be set up for work in less than 20 minutes.



"We solved the housing problem in our own way."

The military field demonstrations of the Engineer Troops included the laying of a mine field 75 feet deep at the rate of 50 yards in 3 minutes, then clearing a path 25 feet wide through the mine field for the passage of equipment.

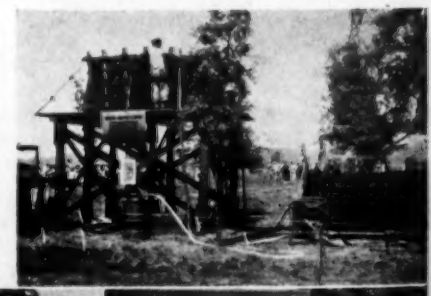
The sniper's ambush showed the success with which troops can be hidden by modern camouflage. Snipers popped out of completely disguised fox holes within 25 feet of the audience, fired from fallen logs, while others, also in camouflage suits, came out of the long grass, a small shed collapsed to permit an anti-aircraft gun to go into action, while a sham boulder in a group of real rocks was thrown aside by a machine-gun crew going into action.

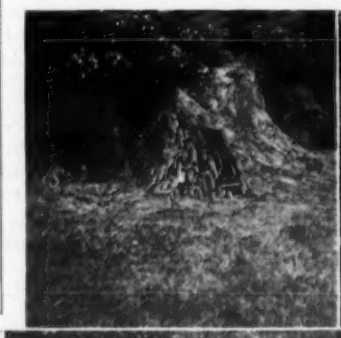
Two squads assembled groups of pontoons and trucks drove down slippery banks to mount them and be transported about the lagoon. Another squad set up a barbed-wire entanglement and then showed methods of bridging it to permit rapid passage of troops. The final action was an attack on a fortified position, involving the use of machine guns, carbines, bazooka guns, flame throwers, hand grenades, and demolition bombs.

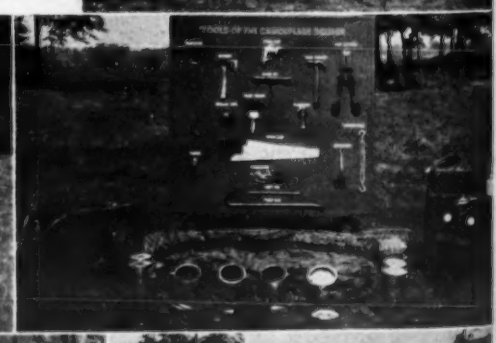
Construction men interested in enlisting in combat, aviation, or camouflage engineer battalions should apply to the nearest Division or District Office, Corps of Engineers, U. S. Army.

ARMY ENGINEERS IN ACTION IN THE FIELD

Action scenes at Orchard Beach, N. Y., during a Recruiting Drive of the U. S. Army Corps of Engineers, July 24-25. Top, field water purification plant; middle, camouflage net over a transport truck; tools of the camouflage soldier; bottom, barbed-wire entanglement, laying and clearing a mine field.







Dustproofing Gravel, Other Road Surfaces

A small folder on the use of calcium chloride for dustproofing has recently been issued by Wyandotte Chemicals Corp., Michigan Alkali Division, Wyandotte, Mich. Among the many uses to which Wyandotte calcium chloride, which is packed in moisture-proof bags containing 100 pounds of flake calcium chloride, may be put are the dustproofing of roads, streets, pavement patches, detour roads, parking lots, airports, playgrounds, dirt floors in buildings, walks, drives, and bridle paths, baseball diamonds, sand golf greens, etc.

A copy of this folder may be secured directly from the Special Products Division, Wyandotte Chemicals Corp., Michigan Alkali Division, Wyandotte, Mich., by mentioning this item.

Air Pressure in Tires

That important phase of tire care and maintenance, air pressure, is thoroughly discussed and important hints on maintaining proper pressure in your tires are included in a new 4-page bulletin entitled "Airing Our Views on Air Pressure" just released by the Tire Conservation Service Department of the B. F. Goodrich Co., Akron, Ohio. Containing facts which every tire user should have, this report is designed to aid in the fight to conserve rubber and keep your present tire equipment functioning efficiently and safely.

Copies of this bulletin may be secured by contractors and state and county highway engineers and equipment superintendents direct from the B. F. Goodrich Co. by referring to this item, or from this magazine.

Clamshell Dredging In Upper Mississippi

Maintenance of 9-Foot Channel at The Head of Navigation for Barges Hauling Materials for War

✦ DREDGING operations at the head of navigation in the Mississippi River to maintain a 9-foot channel so that tugs and tows of wartime river commerce will not be hampered in their steady transportation of vitally needed materials have been started at Minneapolis, Minn., by a 13-unit flotilla operating under the direction of the St. Paul District Office of the U. S. Corps of Engineers.

High waters during the spring months brought Ole Man River to flood stage and swept thousands of yards of silt and sand from the upstate drainage basin down into the 9-foot channel which starts at the municipal docks at Minneapolis. To insure safe channel depth, the District Engineer dispatched a group of river maintenance boats from the Fountain City, Wis., docks to the head of navigation in the river, and dredging operations were started.

The key unit in the flotilla is Barge 767 on which is mounted a P & H LC crane with an 80-foot boom and 4-yard clamshell bucket. The crane is powered by a 205-hp Waukesha-Hesselman engine and is equipped with preformed wire rope, as is also the anchor mechanism on the barge. Other units in the fleet include two diesel-powered tenders, three launches, barges, and supply boats.

The dredge moves along the channel until shallow water is encountered, when the clamshell goes into action. Silt removed from the river is loaded on barges and dumped behind islands in the river. Often a great deal more than silt is removed and many automobile tires, bicycle frames, barrels, and similar "junk" have been brought to the surface. While the dredge is in operation, the barge is anchored by spuds which are dropped into the river bed and anchor the craft in a three-pronged grip.

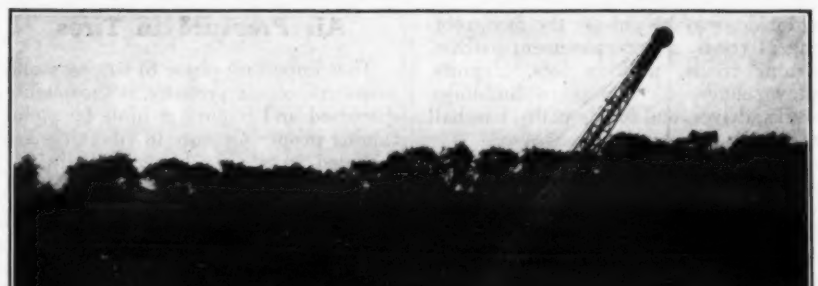
With dredging operations proceeding on a 24-hour basis, a total crew of 40 men work on three shifts of 8 hours each. The clamshell cleans the river bed at a rate of between 2,000 and 2,400 cubic yards every 24 hours, loading to barges having a capacity of 125 yards each.

During these operations, every safety precaution is taken to prevent accidents. Sand is spread on the decks of the boats to prevent slipping and workmen are required to wear life-preserver jackets at all times. All machinery is screened and chains are strung along deck edges. The use of preformed wire rope, which does not fray or wicker out, prevents lacerated hands when it is necessary for workmen to handle broken or worn sections.

Personnel

These maintenance operations are under the direction of L. A. Hauser, Jr., of the St. Paul District Office of the Corps of Engineers. Head Engineer is H. M. Anderly, also of the St. Paul Office, with Richard Thorman, of Fountain City, as Dredge Master. Second in command of the dredge is Robert Grossell who also operates the P & H crane. Lt. Col. Lynn C. Barnes is District Engineer of the St. Paul District which extends down the river 247 miles to Guttenberg, Iowa.

Maintenance operations will continue in this 9-foot channel until cold weather sends the units into winter quarters at Fountain City.



A. U.S.E.D. clamshell dredge clearing the navigation channel in the upper Mississippi near Minneapolis.

Caterpillar Staff Changes

Henry H. Howard, who has been associated with the Caterpillar Tractor Co., Peoria, Ill., since 1926, has returned from a wartime post with the U. S. Ordnance Department in Detroit to become Caterpillar's General Sales Manager. Mr. Howard, who was Manager of the Engine Sales Department when called for temporary duties in the War Department in February, 1942, has served as consultant to Brig. Gen. J. K. Christmas of the Tank and Combat Vehicle Division of the Ordnance Department which has now released him from his duties there.

J. Q. McDonald, who assumed the extra burdens of the General Sales Manager's office in addition to his regular duties as Export Manager when G. E. Spain was promoted to a Vice Presidency in May, 1942, will now be free to devote his experience and time to planning and preparing for the problems and enlarged opportunities which will exist in the export field.

H. W. Smith, Assistant Manager of Engine Sales, who has been in active charge of that department during the time Mr. Howard was in Government service, has been made Manager of Engine Sales.

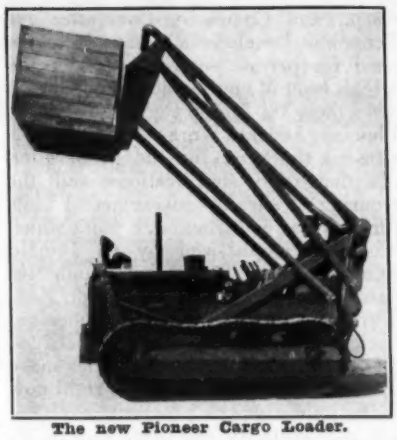
Panama Moves to Right

In anticipation of the opening of the Inter-American Highway, it is reported that Panama is switching from left to right-hand driving. Street lights and signs are being changed accordingly.

A New Loading Unit For Tractor Mounting

Another of the new pieces of equipment designed particularly to meet war needs but which will have many other applications in a peaceful world is the Pioneer Cargo Loader. This unit was designed especially to meet the problem of loading and unloading cargo planes under all possible conditions of terrain and weather.

The Pioneer Cargo Loader, made by the Pioneer Engineering Works, 1515 Central Ave., Minneapolis, Minn., is mounted on a track-type tractor, to provide proper traction under any ground conditions, with the additional feature that the tractor can be used for other work, such as moving planes, loading snow, bulldozing, or towing freight. When the load is down in carrying position, the highest point is under 7 feet, which will pass under the wing of any cargo plane, and provides a clear unobstructed view in all directions for the operator. The unit will pick from ground



The new Pioneer Cargo Loader.

level and load into a plane with a floor 10 feet above ground level. The Loader is operated by two hydraulic rams, taking power from the tractor, and is controlled by levers within easy reach of the tractor operator.

Back the Attack! Buy War Bonds Now.

New Davey Catalog

The complete line of Davey air compressors, as well as its pneumatic saws, is described and illustrated in a new 30-page catalog issued by the Davey Compressor Co., Kent, Ohio. The various models of the Air Aristocrat, with four-wheel mounting; the Davey Premier, also mounted on four wheels and available in five sizes; the Auto Air for truck mounting; the Track Air for tractor mounting; and the Davey split-propeller truck power take-off are all covered in this catalog.

In addition, the Davey pneumatic saw is also described and illustrated. A new Model 1-A 15-inch pneumatic saw has just recently been added to the Davey line and is of particular interest to contractors for tree and pile-cutting operations. A supplementary sheet devoted to this new saw is also available.

Copies of this complete Davey catalog may be secured by those interested direct from the manufacturer by referring to this item.

The prow of one of the new streamlined reinforced-concrete barges.

First Concrete Ship Launched at Belair

Barrett & Hilp, General Contractors, Were Awarded Contract for Shipyard And 26 Reinforced-Concrete Barges; Many Innovations Used

✦ ON June 16, the first of twenty-six reinforced-concrete ocean-going barges was launched by Barrett & Hilp, general contractors of San Francisco, Calif., at their Belair Shipyard. Responding to the urgent need for more and more ships, the U. S. Maritime Commission added concrete barges to their construction schedule in order to increase tonnage capacity without using more of the steel plate needed for other types of wartime vessels. It is planned to put these ship-shaped barges into coastwise service between the two Americas, two of them to be towed by an ocean-going tug, and thus release a large tonnage of freight and cargo ships for overseas service.

The U. S. Maritime Commission awarded two contracts totaling $18,000,000 to Barrett & Hilp, one to construct the Belair Shipyard and facilities, and the second for the construction of 26 reinforced-concrete barges known as B7-D1 dry-cargo barges. Belair No. 2 was launched on June 28 and others will follow on rapid schedule.

The Shipyard

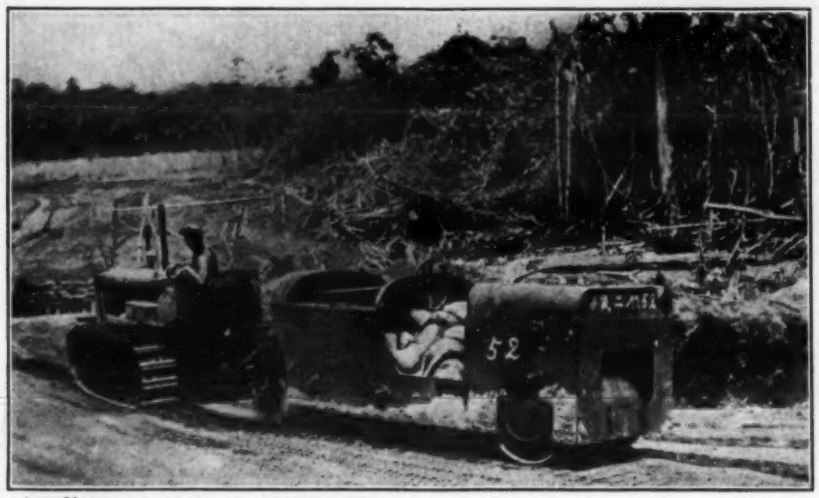
Excavation for the yard started about a year ago, and involved the conversion of a mud flat into 70 acres of shipyard. More than 500,000 cubic yards of dirt was moved in leveling on hill on the site and some fills were 13 feet deep. Six construction, or graving, docks were excavated, each requiring an average of 8,000 pounds of explosives. Each basin is 400 feet long, 84 feet wide and 28 feet deep and required 30,000 yards of excavation. In addition to the six graving docks, there is also a fitting and finishing dock, and an outfitting pier for the installation of equipment. Floating gates hold the water out of the basin until the vessel is completed; water is then admitted to the basin, floating the barge; the gates float and are pulled out of the way; and the barge is pulled out into the Bay by a tug. This basin method of construction reduces both the hazard and cost of launching by sliding down ways.

The shipyard is laid out like a modern factory, all facilities being placed in proper locations for assembly-line production.

Construction of Barges

Each barge is 366 feet 4 inches long, with a beam of 54 feet and a draft of 26 to 28 feet, weighs 5,247 long tons at launching, and has a cargo-carrying capacity of approximately 5,293 long tons. The absence of propulsion machinery increases the cargo space from 20 to 25 per cent. Each barge, which is shaped

(*Concluded on page* 58)



Acme Photo

A Caterpillar D2 tractor pulling a Japanese road roller during construction of a highway between Dobadura and Ora Bay in New Guinea. The roller is part of the war booty captured by U. S. forces.

A.G.C. Meeting Looks To Industry's Future

Planning how the general contracting industry can continue to make its maximum contribution to the war effort and how to develop future markets through private enterprise was the principal business of the meeting of the Governing and Advisory Boards of the Associated General Contractors of America in Chicago June 28 and 29. In summarizing the meeting, President Oscar B. Coblentz, of Baltimore, Md., said:

"One of the outstanding developments was a growing realization of the necessity, in planning future construction markets, for each general contractor to exercise his own ingenuity for the development of needed public and private construction. It was a healthy sign that there was the increasing realization that the building of a greater nation in the future is dependent upon actions of local units of government and upon private enterprise."

Managing Director H. E. Foreman pointed out in his report to the Boards, "The industry in three years has constructed substantially all the facilities needed in this country for training and equipping the armed services to defeat the enemy. This record of construction is unequalled in the history of the world.

"The industry has now entered a difficult transition period, in which the following is required of it: to continue to execute remaining war construction with all necessary speed; to find other ways to continue making its maximum contribution to the war effort; to prepare for its job when peace comes.

"For the remainder of the war, for the readjustment period immediately following the war, and for the period of opportunity to follow, the problems facing the industry and association seem in many respects more difficult than those of the past."

A sound foundation for developing a program of action on planning future construction markets was laid by the four speakers at meetings the first day.

Paul G. Hoffman, President, Studebaker Corp., and Chairman, Committee for Economic Development, pointed to the need for private enterprise to develop a high level of employment immediately after the war. Major General Philip B. Fleming, Federal Works Administrator, stressed the need for the preparation of plans and specifications and the securing of sites by governmental units for post-war construction, a point which was also emphasized by G. Donald Kennedy, Vice President, Automotive Safety Foundation, and Chairman, Post-War Construction Committee, American Society of Civil Engineers, who urged that our cities, counties and states make advance detailed preparations right now for a public works program involving $40 per capita for one year. Edward P. Palmer, President, Senior & Palmer, Inc., and Chairman, Construction and Civic Development Department, U. S. Chamber of Commerce, emphasized that the two fundamental prerequisites for the development of particularly the durable goods industries after the war are: funds in the hands of corporate and private investors, and a confidence that the country will pursue sound economic policies.

Brigadier General C. L. Sturdevant, Assistant Chief of Engineers, reported that the volume of army construction at home this year will reach but 30 per cent of last year's total of more than $5,000,000,000. He spoke on the need for 100,000 experienced construction men in the Corps of Engineers, and outlined the plan which has been worked out whereby men can, through voluntary induction, become specialists in the Corps.

Other business at the meeting included committee reports on market development, labor relations, and taxes. Following a discussion of government contract-awarding procedures at the present time, a motion was adopted that the A.G.C. recommend to all government agencies that they return as soon as possible to the method of awarding construction contracts to the lowest responsible bidder after public openings of advertised bids.

Hot-Mix on U. S. 52 To Widen-Resurface

Scully Bros. Set Up a New Plant for Work in Hamilton And Clermont Counties; An Ohio State SN Project

(*Photos on page 60*)

✦ U. S. 52 along the Ohio River forming the southern border of Ohio has been the scene of considerable highway construction in the past few years (C. & E. M. Nov. 1940, page 15) to meet the increased demands of traffic between Cincinnati and Ironton, Ohio, and thence to the east through Huntington, W. Va. The most recent projects on this strategic-network highway were in Hamilton and Clermont Counties, but were paid for entirely with funds of the State of Ohio without Federal Aid. These projects were completed in the late autumn of 1942 by Scully Bros. of Cincinnati, Ohio.

The project was divided, with 3.5 miles in Hamilton County and 4.767 miles in Clermont County. This latter section included an average 2-foot widening strip on each side of the existing 18-foot highway and a 22-foot leveling and surface course. The leveling course had a minimum thickness of ¾-inch with 150 cubic yards of hot-mix per mile, set up as an extra to take care of irregularities in the old pavement. The top course is 1¼ inches thick compacted. The project was planned for the use of asphalt throughout, but following the bituminous freezing order a change was made, substituting tar for the base widening course in order to use the asphalt available for the leveling and surface courses.

Following are the major quantities involved in the Clermont County section which is the subject of this article.

Insulation course, 1¼-inch, of stone dust compacted in bottom of widening strip.	11,650 sq. yds.
Asphaltic concrete, surface course.....	2,185 cu. yds.
Asphaltic concrete, leveling course.....	2,179 cu. yds.
Base course, widening, tar mix.....	1,942 cu. yds.

An item was set up in the contract for the removal of shattered concrete pavement which was replaced with base course material. Although the original design called for 2-foot widening on both sides of the roadway, advantage was taken of the opportunity to flatten the curves by putting at least 3 feet of the widening course on the inside of all curves to improve the driving quality of the highway.

The Asphalt Plant

The contractor set up a new Cummer hot-mix asphalt plant for these projects in the southeast section of Cincinnati in Hamilton County, about one block from U. S. 52, and on the Pennsylvania Railroad. The asphalt was either trucked in or delivered in tank cars, and the aggregate was trucked in from the gravel plant located about 6 miles distant. The aggregate was rehandled from the stockpiles by a Northwest crane with a ¾-yard Owen clamshell bucket feeding a 3-compartment Butler hopper and reciprocating feeder. The feeder delivered three ribbons of aggregate to the cold elevator of the Cummer plant.

As the plant was located adjacent to a residential section, protection against any possible dust nuisance was provided by the installation of three dust collectors attached to the blower of the 5-foot diameter x 28-foot oil-fired drier. One of the dust collectors was a cyclone, and the other two equipped with spray washers. In addition, the batching platform at the plant was fully enclosed and also equipped with a dust collector. The dried aggregates were raised by the hot elevator to a shaker screen which sized the material and delivered it to one sand and two stone bins of 10-tons capacity each.

Storage for 40,000 gallons of asphalt was provided in tanks, adjacent to the plant, which were heated by a vertical boiler which also provided steam for operating the pugmill gates. The asphalt was pumped through a loop to the batching platform where a 3-way valve permitted drawing off the hot asphalt into the weigh bucket or returning it to the storage tank. Two Fairbanks scales were provided, one for the aggregates and the

(*Concluded on page 36*)

C. & E. M. Photo

A heavy-traffic highway in Ohio is widened and resurfaced with hot-mix.

Future Growth of Cities Should Be Planned for Now

(*Continued from page 2*)

The Post-War Agenda of the National Resources Planning Board sets up nine objectives, social, economic, and industrial, which are ideal, but must be looked at from the practical side. Henry L. Howe, City Engineer, Rochester, N.Y., and President of the American Public Works Association, states it clearly in a letter to us, as follows: "Let's not quarrel with the ideals as set up in this (NRPB) program, but simply insist that such ideals be approached in a practical manner consistent with our democratic form of government, in keeping with our ability to pay, and on a level consistent with the moral and educational plane of our civilization."

The simplified approach to post-war municipal problems involves: (1) A determination to stop planning and start design; (2) A spirit of independence in financing designs and construction from within, rather than from above; (3) A fostering of the ideal of local responsibility for improvement of the community by the community.

Planning Post-War Cities

The background, the setting, the physical conditions, the problems, and the opportunities of each city are so different that in urban redevelopment there is no one formula for either an ideal pattern or a procedure which will fit all localities. Because the post-war cities are in the making today, and because sound plans cannot be made overnight, metropolitan regions and cities must set up objectives and make plans now for the special problems of transition to peace, for adapting their programs to changing state and Federal policies and participation which may be set up to meet the human, physical, and institutional problems which will follow the war, and for the cities' long-time conservation, rebuilding, and development.

Zoning and Planning

Zoning is an important adjunct of post-war planning for a city or region because a well-prepared zoning ordinance gives better control of development and insures proper use of land and future values within the community. The local municipal Planning Board is the second implement in the post-war program through its assembling of a carefully conceived program for the city, but by no means is it secondary to zoning. As stated concisely in THE AMERICAN CITY, March, 1943, Page 5, "Zoning powers, though very important, are definitely limited. Zoning can control the height and bulk of buildings, the uses to which they are put, and impose restrictions as to minimum sizes of new lots. But zoning cannot control the layout of new streets, the selection of sites for public buildings, parks, and playgrounds, the facilitation of traffic flow, the design of new real-estate subdivisions, and the preparation of a master plan for the general guidance of future development. Zoning performs some very important restrictive functions, but it does not do the constructive planning that Hometown will require if it is to gain rather than lose ground in the keen competition among cities that the post-war years will bring."

Dr. Homer Hoyt, of the Chicago Plan Commission, in *The American Journal of Sociology* for January, 1943, states in rather definite terms what we may expect in the post-war city of America, which gives a clue to the character of work and the type of construction which may be anticipated, "In the post-war American city the main downtown area may be greatly expanded to provide for a belt of parking lots and green recreation areas immediately encircling the principal office buildings and department stores. The blighted areas that form sectors of deteriorated housing along railway lines and old industrial sections should be replaced by new model group houses and apartments for all groups of downtown office workers who desire to live close to their employment, regardless of their income. The encircling belt of middle-aged housing just beyond the present central industrial and blighted area will still remain in the first post-war generation, but its oldest structures should be removed, leaving more light and air for the buildings that remain. Likewise, old industrial sections extending in radial lines along railroads and rivers to the periphery will probably continue to be used except for land close to the center, which will be better adapted for other purposes.

"The importance of river frontage has greatly waned, as compared with the industrial advantages of large plottage accessible to railroads. The main new industrial belts thus will probably be located on the outer rim of the present city along major water courses and railroad belt lines. There should be a green belt separating the factory from a zone of garden homes for workers living in the rural-urban fringe."

Deterrents to Post-War Programs

There are three outstanding deterrents to prompt, complete municipal planning for post-war construction. Despite extensive magazine and newspaper publicity on the need for post-war planning and the aggressive work of national and local leaders of industry, some municipal administrations are still held back because of lack of man-power or money-power, or are experiencing such a current boom that they have no time to plan for the future.

A larger number of cities are frankly and honestly fearful lest they proceed in the wrong direction. The war brought readjustments in population to many of our cities, and officials are wondering

(*Continued on next page*)

Needed City Improvements Will Provide Post-War Jobs

(*Continued from preceding page*)

what will happen when great mushroomed war industries close down altogether or subside to a normal peacetime level. Of the 137 metropolitan counties or groups of counties for which estimates are available from the Bureau of the Census, 88 showed a gain in civilian population between April 1, 1940, and May 1, 1942, while 43 showed a decline, and 6 showed no appreciable change. In an address before the American Management Association on "Population Shifts and Post-War Markets", Philip M. Hauser, Assistant Director, Bureau of the Census, divides the metropolitan counties into groups according to the probability that the wartime population shifts will be temporary or permanent. The list and paper may be secured complete from the American Management Association, 330 West 42nd Street, New York, N.Y., as Marketing Series Pamphlet No. 52, price 50 cents each.

The third deterrent is the apparent extent of municipal depression construction under WPA and PWA. In many instances, under the need for creating employment, the programs for the construction of water-supply, sewerage, and power-plant facilities were advanced many years. However, deferred maintenance during the war years and the need for rehabilitation of older systems will provide a large volume of municipal post-war utility construction.

Plans Ready to Go

Most encouraging is the number of cities which have carried their post-war plans through to the "ready-for-bids" stage. Some, like Milwaukee, have set up a 6-year program to be revised annually as new needs are found and plans prepared, but postponed in actual starting from year to year until the demand for men and materials by the war shall relax sufficiently, or entirely, to permit the program to go ahead on its normal planned schedule. The Milwaukee program at present totals $3,540,901, and includes sewer improvements and extensions as well as other items.

The post-war program of the Department of Public Works of Richmond, Va., is divided into preferred projects, desirable projects, and deferrable projects. The acquisition of land is considered a separate project from actual construction. The Department has been busy for some time in the preparation of plans and specifications and has a well-stocked "shelf" of projects ready to be built.

Among the western cities, Seattle, Wash., and Glendale, Oakland, and Santa Monica, Calif., are outstanding in the preparation of plans. These include street, water, and sewerage projects in Seattle and Glendale, grade-separation plans complete in Santa Monica, right-of-way complete for a through highway in Oakland plus plans for the construction of a number of municipal buildings.

New York City has developed an independent post-war program through its City Planning Commission. The program at present involves $628,000,000 of future construction, with $21,600,000 set aside for designing these public works. The projects are not placed in the municipal budget, but the financing and design are being pushed as rapidly as possible ready for V-day. The projects listed for study and planning in the program include scientific institutions, modernizing prisons, new docks, expansion of air terminal facilities, school construction, fire houses, college buildings, the Brooklyn-Battery Tunnel, Bronx highway and grade-separation projects, an express highway across lower Manhattan, highways and sewers in Queens, the Narrows Tunnel to Staten Island, integration of the transit system, and housing.

These cities are chosen somewhat at random, but as examples of achievement in active post-war planning with a definite aim to fill municipal needs as well as provide post-war employment.

Streets and Roads

Municipalities throughout the country are planning extensive projects for the aid of revived motor traffic. Grade separations and bridges, elevated and express highways, improved parking facilities, and expanded street lighting compass this field of post-war construction.

As examples of the character of the work planned, we offer the program of the Borough of the Bronx, New York City, for a comprehensive arterial highway system, with ornamental grade-crossing elimination structures and a new asphalt plant. The borough of Richmond, New York City, isolated on Staten Island off the New Jersey coast, has predicated the design and post-war construction of an express highway and an integrated system of parkways and connecting highways on the construction by the City of New York of the Narrows Vehicular Tunnel to Brooklyn, which, it is estimated, will carry 6,000,000 vehicles the first year.

Pittsburgh, Pa., has appropriated $400,000 for the completion of a study and contract plans for a $16,000,000 parkway which will connect U. S. 22 and 30 east of Pittsburgh with the business district, involving a 4,000-foot tunnel. This is part of a 9-point program, which includes by-passing through traffic, revising street lines in urban areas which need redevelopment, and mapping sewer and utilities services, as well as the completion of a new zoning map to aid in the proper use of land within the corporate limits.

A notable elevated-highway project which is being definitely planned is the continuation of the East River Drive in New York City. The project comprises the construction of an overhead highway between 18th and 23rd Streets to relieve traffic congestion at that point. Preliminary to actual construction, a number of test borings, ranging from 60 to 160 feet deep, are being made to determine the depth of bed rock.

Another of the very real problems for

(*Continued on page 24*)

Two new hard-facing welding rods, recently announced by Stoody Co., to help make equipment last longer.

New Hard-Facing Rods For Acetylene Welding

Two new hard-facing alloys of cobalt, chromium and tungsten, furnished as welding rods for application by the oxy-acetylene process, have recently been announced by the Stoody Co., 1131 West Slauson Ave., Whittier, Calif. Known as Stoody 1 and Stoody 6, both are supplied in 1/8, 3/16, 5/16 and 3/8-inch-diameter rods 14 inches long.

Stoody 1, the harder of the two alloys, provides high resistance to abrasion, corrosion and heat and is specially recommended for hard-facing pump sleeves, dipper and saw teeth, carbon scrapers, expeller parts, and similar types of equipment subjected to abrasive wear. Stoody 6 is not quite as hard as Stoody 1, but is much more ductile and provides greater resistance to impact. It is recommended for hard-facing high-pressure high-temperature valves, gasoline and diesel exhaust valves, various types of dies, shear blades, cams, etc.

Folders explaining more fully the characteristics, prices and applications of these two new Stoody hard-facing rods, as well as other Stoody welding equipment, may be secured direct from the manufacturer.

New Cement Plant Opened

The start of operations in its new cement plant at Northampton, Penna., was announced recently by the Universal Atlas Cement Co., New York City, subsidiary of the U. S. Steel Corp. The new plant, said to be the most modern in the world, is capable of making all types of cement, including white cement. It produces its own power by utilizing waste heat from the kilns to operate steam turbo-generators.

New Welding Shields Are Now Available

A large quantity of new models of Huntsman acetylene and arc welding shields are now ready for immediate delivery, according to a recent announcement by the Davis Emergency Equipment Corp., 70 Halleck St., Newark 4, N.J. The company states that those who have had difficulty in securing welding shields in necessary quantities may be sure of prompt delivery of these models.

These shields embody a number of new features. Designed by a welder for comfort and complete protection, the Huntsman shield has a patented locking device and a comfortable, easily adjusted headgear. The locking device holds the shield in the correct position before the face to assure that the line of vision passes through the lens at right angles to the surface of the glass. It also holds the shield firmly above the head while the welder is preparing, chipping, or surveying his work. When welding must be resumed, a slight nod of the head will lower the shield into the correct working position. The locking device automatically adjusts the shield to the same position each time. Huntsman shields are light in weight, ranging from 1 to 1½ pounds, and are available in six models.

An interesting folder describing these six models may be secured direct from the manufacturer.

Thew Appointment

The Thew Shovel Co., Lorain, Ohio, has announced the appointment of Fred H. Wilhelm, formerly in charge of the design of small machines, as Chief Draftsman and Assistant to the Chief Engineer.

A Wartime Expedient In Dam Construction

Structure of Wood Piles And Sheet Piling Impounds 1½ Billion Gallons Under Low Head in Virginia

(*Photo on page 60*)

+ LOW water in the Chickahominy River, a tributary of the James River, prevented the full development of this source of water supply for Newport News, Va., because the pumping station taking water from the river intake in the middle of the channel could not be used 24 hours daily at all seasons of the year. (See C. & E. M., July, 1943, page 1). Newsom & Aldrich, Consultants for the Federal Works Agency, devised a structure that is a real "first" in dam construction, to be located just below the pumping station and river intake of the 32-mile reinforced-concrete pipe line extending from the Chickahominy River to Newport News. This dam will impound sufficient water in the late spring to keep the pumps supplied during the summer.

The character of the river bed and depth of water are such that neither a concrete nor an earth dam could be built except at exorbitant expense and a lengthy construction period. The dam was needed at once, so it was designed about 1,500 feet long, half of earth embankment and approximately half of untreated wood-pile bents, with a concrete deck to act as a spillway and a facing of wood and steel sheet piling. It will impound 1,500,000,000 gallons of water with only a 4-foot head at the dam at mean low water. A boat lock 15 feet wide and 66 feet long and a fish ladder 30 feet wide, composed of three pools, were included in the cost-plus-a-fixed-fee contract awarded to Boney Construction Co., of Norfolk, Va. The estimated cost was $181,111 and the contract allowed 120 days for completion.

The contract starting date was December 22, 1942, and the contractor had equipment working on the job on December 28. Work proceeded at a fair pace, considering the local competition for labor and the difficulty in securing materials. A very large factor affecting the speed of operation on the 750 feet of spillway was the tide. Work could go ahead only at low tide, even though the average tide was only 2½ feet. In the first eight weeks of the contract one week was lost because of bad weather and another because of unusually high tides. The work on the 730 feet of earth dike on the adjacent marsh continued through all but the worst weather when equipment could not work in the mud.

The Earth Dike

The section of marsh crossed by the earth dike has mud to a depth of about 14 feet. The maximum fill for the dike was only 7 feet, and as some settlement was expected the dike was built slightly higher for its entire length. A Lorain 1-yard power shovel loaded material from adjacent borrow pits to four trucks which had a haul of only about 200 feet to the end of the dike, or a maximum haul of 1,000 feet. An Allis-Chalmers HD-10 tractor with a Baker bulldozer was used to spread the material dumped by the trucks to fill the dike.

The Pile-Bent Dam

The main dam structure is composed of 4 and 5-pile bents spaced 10 feet on centers and driven to a 20-ton bearing. In the deep sections of the river 60-foot piles were required, while 45-foot piles were sufficient in the shallower sections. The 60-foot piles were driven approximately 36 feet into the sand beneath the river muck. The piles were cut off at high water and topped with the concrete cap about 8 inches above high water. Specifications required piles with 7-inch points and 14-inch butts measured 2 feet from the end.

Batter piles were driven downstream from each bent with a 1½ on 1 batter. These piles ran up to 80 feet long and were cut off on the required slope, for connection with the downstream pile of each bent. The batter piles were prepared for the connection by flattening the surface of the pile with axes, adzes and saws. The connection was made by three 1-inch bolts and a timber grid to prevent movement between the piles. Between bents a second batter pile was driven from the upstream side, running through the structure, and connected to the wales acting as connecting ties between the bents. The wales were all 12 x 12-inch lumber.

Cross bracing of 4 x 10-inch lumber was used at each pile bent. At the upper connection for the bolt the pile was flattened and a flat grid used. For the lower ends of the braces the pile was not flattened as the work had to be done under water by a diver, but a grid, concave on one side, was used to fit the pile. The braces were also bolted to each intermediate pile to increase the stability of

(*Continued on page 28*)

C. & E. M. Photo

What the well-dressed diver is wearing in Virginia this year, as he prepares to go below to bolt the under-water cross bracing for Chickahominy Dam.

The Clark Adjustable Fly Cutter.

A New Metal Cutter For Highway Shops

Although shop equipment for the maintenance and repair of highway equipment is as difficult to obtain these days as are new machines for use on the highways, state and county repair shops are looking forward to the day when they can replenish their present equipment and supplement it for the future. Among the new machines for this purpose is the Clark Fly Cutter for cutting holes or discs in metals of thicknesses up to 1 inch, including boiler plate, stainless steel, cast iron, as well as rubber, plastics and other materials. Among the operations which have been handled by this new tool is that of cutting washers and gaskets from "live" rubber and other substances.

Some of the Fly Cutter's features include a generous clearance between the work and the body of the tool to make possible deeper cuts with less strain on the tool, and a new cutting technique to eliminate chatter and assure clean holes. The tool is obtainable with straight or tapered shank and covers expansions of 4 to 10 inches in diameter, including all decimal or fractional intermediate sizes.

With this addition to its adjustable hole-cutter line, the Robert H. Clark Co. now provides tools for cutting holes from 5/8 to 10 inches in diameter and straight side discs from 4 to 10 inches in diameter. Models for cutting diameters from 5/8 to 5 inches, and for cutting holes in pipe and curved surfaces, have three cutting blades, while those for cutting diameters from 4 to 10 inches are of the two-blade Fly Cutter type.

The Clark line also includes a new adjustable surface facing tool of special interest to shops which cannot justify maintaining a full line of expensive high-speed end mills and angle cutters, available in four models with an expansion capacity of from 1 to 5 inches.

The bits on all of these tools can easily be reground or can be replaced with new bits at comparatively small cost, thus lengthening the life of the tools indefinitely.

Further information on these Clark adjustable cutting tools, which are available now on suitable priorities, may be secured by interested state and county equipment superintendents and contractors maintaining their own repair shops by writing direct to the Robert H. Clark Co., 3424 Sunset Blvd., Los Angeles 26, Calif., and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

New Truck Battery Guide

During the past year, heavy truck-type batteries have become increasingly difficult to obtain, due to the large numbers required by the armed forces for trucks, tanks, PT boats, landing barges, and similar service. There is, however, an adequate supply of certain types of batteries or combinations of these batteries which may be used in civilian truck fleets, the United States Rubber Co. reports.

In order to provide full information on battery purchases and care, this company has recently issued a complete "Truck Battery Guide". This publication shows that 98 per cent of all trucks may be serviced by passenger-car batteries which are available in adequate quantities; it contains up-to-date information on recommended battery sizes for trucks, tractors and buses by make, model, and year of manufacture; it provides a formula for determining the right selection of batteries for individual truck operating conditions; and furnishes much information on heavy service batteries of all types, dimensions, capacity ratings, assembly plans, and recommended type substitutions.

As part of their service to truck operators, U. S. battery distributors provide a special fleet battery analysis, which lists the number of trucks, average mileage per vehicle, recommended types of batteries needed, etc. Copies of the Truck Battery Guide may be secured by interested contractors and state and county highway departments from their local U. S. battery distributor or direct from the U. S. Rubber Co., Rockefeller Center, New York City 20, by mentioning this magazine.

Army-Navy "E" Awards

The Army-Navy "E" Award for excellence in war production has been made to the following companies: Blaw-Knox Co., Blawnox, Pa.; DeLaval Steam Turbine Co., Trenton, N.J.; Pettibone-Mulliken Corp., Chicago, Ill.; and Sullivan Machinery Co., Michigan City, Ind. The United States Rubber Co. has received its fourth "E" Award, the latest one going to its Eau Claire, Wis., Ordnance Plant.

Oil Mats and Seal On Colorado Roads

Asphalt Road-Mix Surfaces Laid by Maintenance Crews After Grading Contractor Has Completed Work

(*Photos on page 60*)

✦ THE ever-increasing mileage of smooth easy-riding 1½-inch compacted oil mats with chip seals on Colorado highways is the result of a program planned several years ago to insure uniformity of work. The contracts for grading usually included large yardages and considerable rock work, both on widening and new locations, and Colorado contractors are well equipped to handle these jobs. By constant training the Colorado State Highway Department has developed crews of maintenance men who are now specialists in oil-mat work and who complete a mile a day as a regular 8-hour job.

Prime and Gravel

After the gravel surface of the highway has been brought to the required standard for strength of base, it is primed with MC-0 at 0.3 gallon per square yard, applied for 2 feet outside the prescribed limits of the mat on both sides of the road. The entire road is primed at one time. Following this the maintenance crews begin hauling in the gravel for the oil mat. This is supplied by the state's own portable crushing plants which have an operating crew of about 25 men for each plant. A fleet of 20 to 25 trucks is usually used for a 5 to 6-mile haul to the road. The gravel is windrowed, at the rate of 1,200 tons per mile for a 22-foot mat, down the side of the road where it will offer the least interference to traffic. The time allowed to elapse between the priming of the road and the starting of the windrow is usually about 24 hours.

Shooting and Mixing

The windrow is flattened to about 12 feet wide on one side of the road. Then the asphalt is applied ½ gallon at a time by a 12-foot spray bar for a total of 1 to 1.3 gallons of SC-3, and sometimes SC-4, per square yard. The windrow is mixed between each ½-gallon increment of oil. The mixing fleet is an imposing sight for there are as many as 8 to 10 graders in operation on one 1-mile strip. The oil is first distributed through the gravel by turning over by a 24-inch disk harrow and then the blades take over, turning the material back and forth across the road until it is a homogeneous mass of well-coated aggregate. The unit of operation is usually one mile as that has been found to be the best length to insure completion in one working day and reduces the number of joints where difficulty usually develops in blending one operation into the next. If a more satisfactory turning point is found a few hundred feet beyond the mile, then the distance to be worked in one day is extended to as much as 1.2 miles.

After mixing is completed, the surface is spread to the required width and rolled at once by Bros pneumatic rollers, before traffic has a chance to hit it. If the traffic on the road is heavy, then only one roller is used and that on the edges where the traffic does not concentrate. If the traffic is light, then two rollers are put into operation. No steel-wheel rolling is used as it is too slow for this type of operation.

Sealing Operation

The Maintenance Division prefers to wait until the following season for the sealing of an oil mat as this allows time for weaknesses in the base or the mat to develop, and if it is necessary to pick up the mat and remix, then the seal is not lost. For example, there are times when the considered judgment of the foreman in charge of the oil-mat operation is that the base is sufficiently dry to start work, or that after a rain the windrow is not wet and therefore it may be laid down on the base.

If an error in judgment is made, the mat will not "stay put" on the base, but will crawl and creep, leaving unsightly

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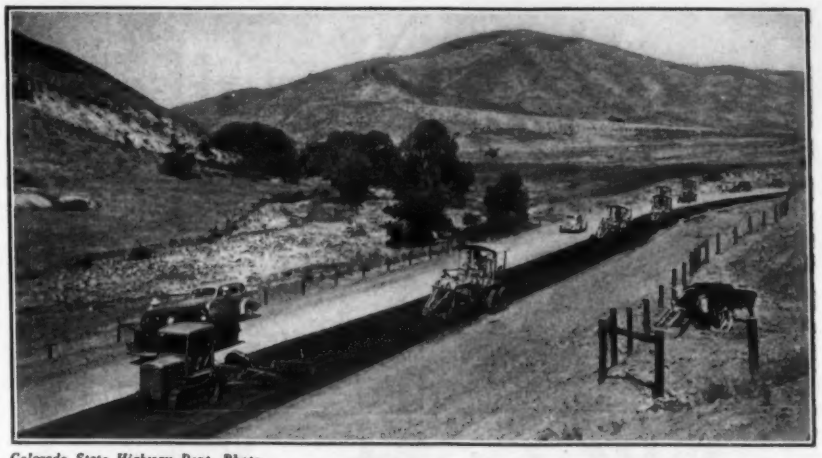
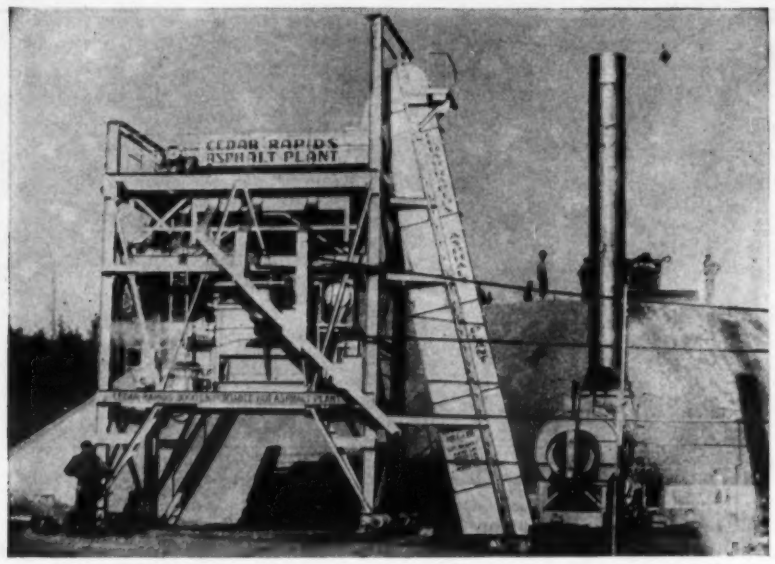


Colorado State Highway Dept. Photo
The grader parade mixing oil mat on a Colorado highway.



A new portable asphalt plant with a 3,000 to 4,000-pound capacity.

Big Asphalt Plant Is Readily Portable

In spite of its large capacity of 3,000 or 4,000 pounds of hot or cold bituminous mix per batch, the new Cedarapids Model E asphalt plant made by the Iowa Mfg. Co., Cedar Rapids, Iowa, is featured by speedy erection or knock-down, and easy portability by truck.

Operation of this plant is fast and efficient. Starting with the drying unit, which is mounted on pneumatic-tired wheels, the aggregate is carried by the hot material elevator, which is enclosed in a dust-proof housing, to a Cedarapids-Symons double-deck horizontal vibrating screen, from which the graded aggregate falls into a three-compartment storage hopper having a capacity of six batches. Both hopper and sizing screen are totally enclosed in a steel dust-proof housing. From the hopper, the proper proportions of material are dumped into the aggregate batcher, mounted on dial-indicating springless scales. The steam-jacketed asphalt batcher is also mounted on scales. The batchers deliver the material into a 3,000 or 4,000-pound twin-shaft steam-jacketed all-steel pugmill. Electric, gasoline or diesel power may be used. On electric-drive plants, each unit is powered by an individual electric motor, eliminating countershafts, bearings, chains and sprockets, and permitting simplicity and faster assembly and knock-down. Controls for all operations, including the bin-gate levers, batchers, gate levers, pugmill discharge lever, and motor push-button switches, are centrally located on the operator's platform.

Knocked down into three units, each mounted on pneumatic-tired wheels, this plant can be transported by trucks at 30 to 40 miles an hour. On location, the plant can be erected by a small crew, and without the aid of a crane, in 12 to 18 hours. First, the screen and hopper unit is rolled into position. The tower units are laid out on the ground and assembled. By means of a power unit coupled to a cable winding drum shaft at the base of each tower, and a chain block attached to the towers and bin unit, the towers are hoisted upright against the bin and screen unit. Girts and diagonals are bolted into place, completing the tower. It is then a simple matter to hoist the screen and hopper unit, batcher and pugmill unit, and the hot-material conveyor into position. With the drier in place, the accessory units installed and power supplied, the Cedarapids Model E asphalt plant is ready to go to work.

Booklet on Wrenches, Their Uses and Care

The importance of modern socket wrenches is the subject of a new booklet offered to wrench buyers and users by the Blackhawk Mfg. Co., Milwaukee 1, Wis. Entitled "Meet the Mechlins", the booklet has many humorous illustrations depicting "Mechlins", the trouble makers for men who handle wrenches. Although its recommendations are handled in this fashion, the booklet contains valuable suggestions on the extra utility, speed and safety which modern socket wrenches can give. The book also gives suggestions for prolonging the life of all small hand tools.

Copies of "Meet the Mechlins" may be secured by wrench users and buyers without obligation direct from the manufacturer by mentioning this item.

We can't all shoulder a gun, but we all can buy one. Help finance the war and prevent inflation by the regular purchase of War Bonds.

Power Shovel Care To Keep 'Em Digging

Redoubled Maintenance Necessary to Keep Present Machines on Job; Here Are Some Suggestions

✦ AT no period in our history has there been a greater necessity for conserving power shovels and similar equipment through constant care and intelligent maintenance, George E. Miller, Chief Engineer, Buckeye Traction Ditcher Co., Findlay, Ohio, pointed out recently in a bulletin containing suggestions for the proper care of excavating equipment. The production of power shovels for commercial use has practically ceased, Mr. Miller stated, and all work not under the direction of our armed forces must be carried on with the equipment now available for private jobs. In order to do this, the first of Mr. Miller's suggestions, which form the basis for this article, is that both owner and operator get acquainted with their machinery.

Because of its brute strength and ability to go almost anywhere on powerful crawlers, it is easy to regard the modern power shovel as something that will slug its way along until it falls apart of old age. Only when the man who runs one really appreciates the careful adjustments and close relationship of the parts of a shovel, will he see the need for redoubling his maintenance operations if the machine is to remain in use for the duration. Careful attention to minor and often overlooked service operations will materially lengthen the life of your shovel.

Lubrication

That proper lubrication is vital to upkeep is recognized by all makers of earth-moving equipment, and each manufacturer provides charts on which all lubrication points are clearly indicated, together with the type of lubricant to be used at each point and the interval between lubrication periods.

Realizing that the many grades and classes of lubricants required reduction and simplification, the War Department, after much study and many tests and experiments, has set up a modified lubrication program calling for three oils, five greases, and two gear lubricants which it is believed will suffice for the needs of all heavy machinery and permit uniformity of manufacture by the different refiners. Broken down, these Army specifications call for three general-purpose greases, a lubricating oil for chains, wire rope, etc., and a wheel bearing grease, two gear lubricants, SAE 90 and SAE 80, and three engine oils, SAE 10, SAE 30 and SAE 50. Although some deviation from this list was formerly considered advisable for the most efficient performance of a particular machine, it appears to be the consensus of opinion among most manufacturers of power shovels that the kinds of lubricants enumerated are adequate for almost all normal lubricating purposes.

It is pointed out that while the War Department lubrication program is intended to simplify lubricants for Army equipment to the lowest point consistent with efficient operation, there will actually be more than the ten lubricants mentioned available in the field. This is because the so-called standard lubricants will not completely perform the specialized functions of certain special fluids required for hydraulic brakes, shock absorbers and the like. It is suggested that, while the trend toward simplification will no doubt be a boon in the future, owners of power shovels in civilian service should avoid too much simplification in their own lubrication programs. The prime necessity is to keep present shovels in working trim, with a minimum of wear to parts which are extremely difficult, if not impossible, to replace.

Another innovation introduced by the Army lubrication program is the use of 8 hours as a time unit. This provides for proper and regular lubrication at the end of each 8-hour period of use. In peacetime, 40 to 60 hours may constitute a working week. On a military project or on two and three-shift private operations, a piece of earth-moving equipment may be in operation 24 hours a day. When this occurs, the operator finishing a shift greases all points calling for 8-hour service before turning the equipment over to his successor.

Frequent Check Necessary

Continuous and thorough inspection of all parts is another military mandate which the civilian operator will do well to follow. Frequent testing and scrutiny will anticipate many of the things that go wrong with a shovel. When proper adjustments are not made, wear increases and the period between repair or replacement of the part or assembly grows less. If indications point to something amiss, stop the shovel at once, find out what is causing the trouble, and correct it. An intimate knowledge of your machine will increase its life and useful-

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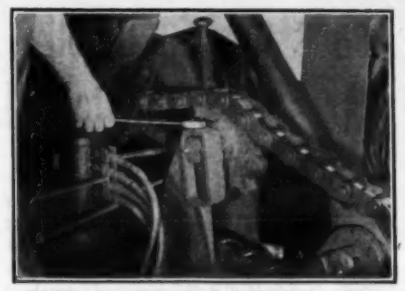


Tightening the crowd chain on a power shovel by adjusting the deck idler. Such adjustments extend the service life of excavators.

Roads in Ada County Are Well Maintained

(*Continued from page 2*)

up to standard. This is done with a pre-mix of SC-3 laid 5 inches thick at the edges and 2½ inches throughout the balance of the mat. If there is a base failure, a full 12 inches of crushed gravel is put in and thoroughly compacted. Most of the county has a good supply of gravel but there are a few sections where there is only sand and in these the hauls for satisfactory gravel are expensive.

After base repair and patching are completed, the surface of the road is cleaned by hand brooming, scraping, and, in the case of some work, is washed by the county flusher, a John Deere tractor hauling a 1,500-gallon tank trailer, which is usually used for fire protection but the pressure developed makes it an excellent flusher. This washes the fines off the road even more thoroughly than rotary or hand brooming possibly can. When dry, the surface of the road is primed usually with MC-4, but last year an asphalt emulsion was used, at the rate of 0.25 gallon per square yard and covered with commercially produced chips at 30 pounds per square yard. These are applied by a Buckeye spreader. In 1942 the work was done by contract because of the lack of men to operate the county crusher and for the extensive road work. Formerly the regular maintenance crew did the full operation. The 10 miles that was sealed required a 14-mile haul for the chips. The type of seal described has proved very successful in the past with the MC-4, there being no loss of chips and no brooming required to spread them evenly. Traffic does all the compaction as no rolling is done by the county.

County Organization and Finances

The County Road Department is administered by three county commissioners, elected from districts every two years. At each election one commissioner is chosen for two years and one for four years. They appoint the County Engineer for an indeterminate period.

The funds for the operation of the County Highway Department come entirely from license fees and state gas tax money. A $5 vehicle license tax produces a fund from which the counties get 87.3 per cent. In Ada County this amounts to about $100,000. A portion of the 5.1-cent state gas tax is also prorated to the counties. The sum which Ada County receives annually from these sources for its roads must cover maintenance, construction and bridges. The law permits a real-estate tax up to 2.8 mills but none has been levied for at least three years.

County Bridges

In the past the county has maintained a special bridge crew for bridge maintenance but the present lack of labor in the district, due to war activities and the call for men to military service, has made the continuance of this crew impossible. The work on bridges has been with native timber almost exclusively.

Some of the operations of the bridge department are indicated by the following items. Recently a bridge with a light pony truss of 50-foot span collapsed under a heaviest-type crawler tractor and the county crews replaced the structure with a 29-foot-span creosoted-timber structure. The stringers are the full length of the span and ten of 8 x 20-inch x 28-foot timber were used. The laminated deck was laid with 2 x 6-inch lumber. The new abutments are of mass concrete with no reinforcing. This structure spans a drainage ditch and is of a standard design, two of which were built last year.

An interesting job done by the county bridge forces was the removal of a 165-foot steel bridge over the Boise River, cutting out the center span and re-erecting it as a bridge over Indian Creek to replace an old unsafe wood truss structure.

The County Shops

The county has a 260 x 50-foot fireproof building for the county shops, county engineer's office, and warehouse facilities. This was built by the WPA for the county and that Federal organization occupied about one-third of the building with its state headquarters after the building was completed. The basement of the building, entered by ramps from either end, provides excellent shop space. Three overhead doors at each end permit equipment to drive in to the shop section or for storage. Within the storage section is a locked room for the equipment tires, all of which are now branded "Ada" with an Everhot branding iron. In the stock room every type of part and material needed quickly by the repair shop is kept in convenient bins. No stock is carried for the Ford motors as it has been the policy to trade motors whenever there was need of repairs on any of the truck motors.

The blacksmith shop at the end of the building has a power grinder and buffer, a drill press, a Worthington garage compressor, a trip hammer, an Oxweld acetylene generator, a Westinghouse arc welder, a forge and anvil, and three heavy-duty benches for the mechanics. The county ordinarily employs three mechanics in the shop but feels lucky at present to have a single mechanic working there, because the

(*Concluded on next page*)

Irrigation Problems Handled by Ada County

(*Continued from preceding page*)

demands for mechanics in war industries in the vicinity are very great and it is impossible for the county to compete in the wage range paid in war work.

In addition to the shop equipment mentioned above there is a Delta grinder and buffer, a valve resurfacer, and an A-frame on casters using a Chisholm-Moore puller for a hoist. A section of the shop is set aside for lubrication and lubricant storage. Here a rack with the necessary Alemite hand guns aids the men in this work.

Other Equipment

The county crushing plant, a Pioneer crushing and screening plant with an 8 x 36 jaw crusher and 18 x 24-inch rolls, is mounted on solid rubber tires of ancient vintage, making it very easy to move the plant from one pit to another. It is driven by a Caterpillar D13,000 electric plant. The county also owns a 3/8-yard Speeder shovel powered by a Caterpillar diesel.

The county stores at its large yard adjacent to the highway building and the county fair grounds its Jaeger 3-bag concrete mixer and Rex 1-bag mixer as well as a LeTourneau ripper that has done some major operations in eliminating the need for blasting in soft rock.

For snow removal the county uses its patrol graders. It does not own any truck plows as it finds the amount of snow falling in the Boise area can be readily removed from county roads by the power graders. A pair of Caterpillar D6 tractors, one with a LeTourneau bulldozer and the other with a 6-yard LeTourneau scraper, prove effective in dirt-moving operations.

The amount of mowing of county shoulders along the roads is kept to a minimum to save money. Only one swathe is mowed on any one road on the two sides. A John Deere tractor and power scythe and a Centaur mower are used for this work.

Problems and Progress

As a large portion of Ada County is irrigated, considerable difficulty is experienced with the location of the irrigation and drainage ditches. The irrigation ditches are always run along the high points or ridges and naturally control highway grades because of the culverts needed for highway drainage. Consequently, culverts throughout the county have a minimum of cover, a matter of a few inches of gravel.

A large section of the county has been developed by small settlements or developments around Boise with county schools serving the population. This area is practically "city" and so the county has built over 2½ miles of concrete sidewalk 4 feet wide and 4 inches thick on a minimum of 6 inches of gravel fill. This work started as a WPA program and proved so beneficial that the county has taken it over as county work when the WPA work program was stopped. The concrete used is a 5-bag-per-cubic-yard batch.

C. & E. M. Photo

The south end of the Ada County Highway Department Building at Boise, Idaho, showing the entrance ramp to the basement garage and repair shop.

Another problem connected with the irrigation system is that the farmers want to use the borrow pits of the county road system for run-off from their irrigated lands, and use either the drainage ditches or gutters of the roads for handling surplus water from their irrigated fields, much to the detriment of the road system.

The county highway system is administered by the Board of County Commissioners consisting of W. L. Hendrix, J. M. Dodds, and Maurice E. Adkins. C. L. Varian, County Engineer at the time this article was written, has joined the Seabees; Lee Headrick was appointed County Road Superintendent.

Steel for South America

The wartime difficulty of obtaining steel from the United States and Europe has aroused new interest in the other Americas in the possibilities for local steel production or expansion of existing capacities. The major expansion in steel-making capacity is under way in Brazil, where the biggest plant in South America is being built at Volta Redonda, to be completed in 1944. Mexico is also increasing its steel capacity.

In addition, Argentina, Chile, Peru and Colombia have undertaken smaller projects for developing steel production or have been studying possibilities for local projects. However, most of the projects being considered depend upon the prospects of getting equipment from the United States, and war industry needs in this country and the shipping shortage lessen these prospects.

North Carolina Starts Plans for Post-War Work

Application has been made to the Public Roads Administration by the North Carolina State Highway and Public Works Commission for Federal funds amounting to $32,550 to aid in financing advance plans for post-war highway improvements in that state. The funds requested represent 50 per cent of the estimated cost of making surveys and preparing specifications for nine highway projects to be built after the war. The remainder of the cost of the surveys and plans will be met by North Carolina, on a matching basis. Such allocations of Federal funds are made possible by the Defense Highway Act of 1941, which established a $10,000,000 fund to assist state highway departments in their post-war planning.

The nine projects proposed involve the relocation of sections of Federal routes in eleven counties and total 119 miles.

A Guide to Lubrication Of Dirt-Moving Equipment

Another article in the series prepared by engineers of The Texas Co. on the selection and use of lubricants appears in issue No. 5, Volume XXIX, of *Lubrication*, entitled "Earth Moving and Open-Pit Iron Ore Mining". Many of our contractors probably do not realize that earth moving is a very large part of open-pit mining and that much of the equipment used on highway grading is used in this industry. The article itself is very valuable and should be in the reference file of dirt-moving contracting organizations.

Readers of CONTRACTORS AND ENGINEERS MONTHLY interested in securing copies of any of these should write direct to Advertising Division, The Texas Co., 135 East 42nd St., New York, N. Y.

Buy War Bonds regularly

New Manual for Concrete And Mortar Computations

A new booklet to provide reliable data from which engineers and contractors may determine quickly the quantities of materials required for variously designed concrete and mortar mixtures has recently been issued by the North American Cement Co., 41 East 42nd St., New York City. The concrete proportioning data are made available on a volumetric basis as well as on a basis of weights of materials.

Copies of this Manual for Concrete and Mortar Computations may be secured direct from the company.

Roadside Experience In Lone Star State

Diplomacy and the Creation Of Interest by Abutting Property Owners Aid; Ways Of Preventing Erosion

✦ FOR nearly fifteen years, through its Construction and Roadside Development Divisions, the Texas Highway Department has been working to improve the highways of the state. This has brought an accumulation of experiences, some of which were recounted to us by Jac L. Gubbels, now Director of Urban Planning and formerly Head, Roadside Development, Texas Highway Department, during a trip south on U. S. 81 from Austin toward New Braunfels and San Antonio. For a dozen years this highway has been serving as a laboratory where the value of the better types of roadside-development activities could be demonstrated to the public and to highway department engineers. Not all have been accepted, but in the first 12 miles south from Austin one may see interesting examples of improved roadsides accomplished and in the making.

Diplomacy is not always among the outstanding attributes of engineers, but its use and value in acquiring right-of-way are well shown in several sections pointed out. When one section of U. S. 81 was being improved, the county tried to purchase the additional right-of-way required, as is the practice in Texas. The property owner did not understand the nature of the improvement and refused to sell the strip of property for the state-sponsored program.

Rather than resort to condemnation proceedings, the state engineers asked permission to remove the fence temporarily, grade the backslope on a 6 to 1 slope and then put the fence back in its original location, but at a lower elevation. The owner was so pleased with the results that he donated the required right-of-way to the state and the fence was then set back to the new property line. In this case the work was undertaken to reduce erosion of the slopes by flattening them and doing away with ditches.

Considerable trouble had been experienced with the railroads in securing their cooperation in the program of removing the unnecessary twin ditches, one at the edge of the highway right-of-way and the other just beyond, behind the railroad fence. In most cases there were two fences as well as two ditches. In spite of all endeavors, the elimination of the extra fence, which was not an adornment to the highway, could not be secured. At last it was found that there was a very real reason for this lack of enthusiasm, namely, that the railroads carried these fences as real assets at a very high figure. A careful negotiation finally secured the cooperation of the railroads and the extra fence and extra ditch were eliminated, much to the benefit of the drainage of the highway and railroad, a reduction in maintenance costs to both, and a better appearing roadside.

Like the sight-seeing bus guide, Mr. Gubbels said "On your right . . ." but in this case it was something that could *not* be seen. The missing object was a caliche borrow pit. Yes, it really was there but well masked from the traveled way by leaving the *existing* vegetation next the highway and entering from the rear of the lot, a simple matter requiring a slightly greater haul but a much better appearing roadside at no expense for replacing ground cover and shrubs that had existed for years.

Wild Georgia cane is used for erosion control in south Texas where it grows in profusion. In one case, however, masses of it were planted on the shoulder to mask an unsightly automobile graveyard, which now has completely disappeared.

Fighting Accidents

U. S. 81 is a 3-lane highway which had a bad accident record. The Landscape Division tried its hand in reducing this constant loss of life by reducing the apparent spaciousness of the highway. It was reasoned that the "wide open spaces" gave the driver the feeling of freedom and a desire for unrestricted speed. By planting shrubs and light growth, such as cane, close to the edge of the road at intervals of slightly less than ½ mile and at grade breaks and culverts, the driver is instinctively given the feeling of a narrow road on which he must drive more carefully, which means reduced speed. The plantings of this nature actually resulted in greatly reducing the speeds and number and severity of accidents on this highway.

It is the practice in Texas not to try to lay back long flat slopes in chalky rock as these cannot be sodded and it creates a glare which is disconcerting to the traveler. Sodding was tried in several instances and the run-off of rains washed the ground out from under the sod, leaving it without supporting soil. Now the method is to leave the slopes short and steep and set in scattered vines to break up the area of white earth, and

(*Concluded on page* 52)

C. & E. M. Photo

The vista was narrowed near the junction of U. S. 81 and a side road to Buda, Texas, by masses of trees to reduce the tendency to high-speed driving at this intersection.

Official U.S. Army Photo
A saw mill somewhere in the South Pacific operated by men of the Engineer Corps to provide the lumber for building piers, warehouses, and barracks for our forces on a South Pacific island.

Highway Bill Makes F-A Funds Available

On July 7 Congress passed and sent to the White House H.R. 2798 which makes available to the states until one year after the end of the war unobligated balances of currently authorized Federal-Aid funds and permits the use of part of these funds for post-war highway planning. This bill was signed by the President on July 13.

As finally approved by the Congress, the measure makes available approximately $170,000,000 of unobligated balances of Federal-Aid highway funds, already apportioned to the states, for the duration of the war and one year thereafter, of which amount $50,000,000 may be used by the states for advance planning, surveys, and engineering of specific post-war highway projects. The sum of $27,500,000 was authorized for the construction of access roads to sources of raw materials. It further provides that the cost of acquisition of rights-of-way may be included as construction cost, with the result that the states and the Federal Government will share highway right-of-way cost.

It also authorizes a sum of $10,000,000 of Federal funds for the entire cost of the repair or reconstruction of roads or bridges damaged by floods, hurricanes, earthquakes, or landslides during the war and one year thereafter; and provides for reimbursement by the Federal Government to the states for rehabilitation or repair of any roads or streets damaged by the Army or Navy or contractors engaged on Federal projects. It also makes possible the use of Federal funds to reimburse states for 50 per cent of the cost of toll bridges on the Federal-Aid highway system which have been or may be acquired and opened to free use on or before January 1, 1945.

Funds authorized by the Act may not be impounded or withheld from obligation or expenditure by anyone "unless the War Production Board should certify that the use of critical material for additional highway construction would impede the conduct of the war."

Flooring for Shops, Garages and Hangars

A new water, oil and grease-resistant flooring, known as AWOG floor, has recently been developed by the Flexrock Co. and is designed not only to facilitate cleaning and sanitation but also to provide greater durability and wearing qualities. It is reported to withstand the heaviest traffic and punishing use, such as the rolling of drums and barrels and the weight of heavy trucks and equipment.

AWOG is recommended for new floors or for repairing and resurfacing old floors of any size. It can be laid on concrete, brick, stone or wood, and is well adapted to use in the shops and garages of state and county highway departments and of contractors, and for warehouses, hangars and repair shops at air fields and military bases.

Further information on AWOG flooring may be secured by those interested direct from the Flexrock Co., Desk F9, 2300 Manning St., Philadelphia, Penna.

Equipment Care On Alcan Highway

Tough Going and Scarcity Of Parts Called Forth Ingenuity of Mechanics; "An Ounce of Prevention"

✦ ONE of the most serious problems in the construction of the Alcan Highway, which has recently been officially designated as the Alaska Highway, has been the extreme difficulty in obtaining a steady and satisfactory supply of replacement parts for the more than 6,000 individual pieces of heavy construction equipment that have been, and still are, on active duty along this 1,680-mile construction front. From the first of June, 1942, when bulldozers and pneumatic saws first faced the wall of forests and rocks which stood between Fort St. John, B. C., and Fairbanks, Alaska, the highway equipment was in gruelling service constantly, 22 hours every day, Sundays and holidays, until late November when sub-zero temperatures ushered in the long cold winter, and most of the construction operations on the highway were halted.

The fact that contractors operating under the management contracts of the Okes Construction Co., of St. Paul; R. Melville Smith Co., Ltd., Toronto; Dowell Construction Co. of Seattle; and Lytle & Green, Sioux City, Iowa, in cooperation with the U. S. Army Engineers, managed to push through uncharted wilderness a passable highway in four months with an extremely limited supply of parts is an everlasting tribute to the inventive genius of the crew of mechanics on the job.

Necessity and Invention

The old adage about necessity being the mother of invention has been borne out over and over again on this job. When generator brushes on trucks burned out and no replacements were in stock, motors were idle only as long as it took a mechanic to fashion replacements from the bark of a tree. Another equally practical mechanic took out his pocket knife and whittled idling jets from bits of wood when he failed to find the required parts in stock.

Even after communications and transportation facilities improved, making it possible to secure some replacements, the mechanics went right on improvising. Gears which any mechanic in this country would contribute to the scrap drive are taken to the shop and rebuilt, forged or recut. Burned out connecting rods are rebabbitted and reused.

Welding on the Job

It is probably safe to say that the Alcan Highway could not have been built without the hundreds of welding outfits which went up with the first crews and will be on the job until the last piece of equipment has been shipped away. From the day the trail-blazing bulldozers hit the tall timber, welders have been cutting machinery to size for air shipment and welding it back together again at the site of the work. When cable clamps were found to be non-existent, welding outfits were used to splice eyes on the preformed wire rope so that it could be placed in urgently needed service. Day and night, the blue-white light of acetylene torches have punctuated the progress of mechanics as they fitted together into workable units the discarded sections of three, four or five machines of diverse make. Repairs were made while construction operations went on, with sprockets and shafts cut from discarded parts to avoid delays.

The Okes Co. Shop

The Okes Construction Co. of St. Paul, which holds the management contract for some 300 miles of the southern sector of the Alcan Highway, established a completely outfitted garage and warehouse at its base camp just north of Fort St. John. Here, in an L-shaped structure erected of double sections from CCC camp buildings, C. M. Gillespie, Superintendent of Equipment, directs the activities of eighty mechanics whose task it is to keep the machinery working.

This repair shop, which handles most of the major repair work for the 1,600 pieces of equipment on this section of the highway, is equipped with four lathes, a shaper, drill press, piston turner and grinder, milling machines, arc welders, and a small forge. Here shafts are rebuilt, valve inserts built up, gears are forged, lower track wheel pins for shovels are made, roller chain sprockets repaired—to mention only a few of the varied tasks. It was impossible that all the necessary tools to handle the special parts of hundreds of different makes of machines would be available on the job. So, when a special

(*Concluded on page 46*)

North Dakota Engineers Now Required to Register

An Act providing for the registration of professional engineers was passed by the 1943 North Dakota Legislature and approved by the Governor, and became effective July 1. North Dakota is the forty-sixth state to require the registration of engineers. The preparation, introduction and passage of the act resulted largely from the efforts of the North Dakota Society of Professional Engineers which was organized in 1940.

The Governor has appointed Jay Wesley Bliss, City Manager, Minot; Alexander Carothers Burr, Consulting Engineer, Jamestown; and Clifford Johnson, Bridge Engineer, State Highway Department, Bismarck, as the three-member State Board of Registration for Professional Engineers.

Better Transportation In Post-War Period

(*Continued from page* 11)

cities to consider in their post-war plans is the question of proper, convenient, economical, and adequate parking facilities. The day of hit-or-miss parking and of control merely by penalizing the would-be shopper by taxing his use of the only parking place available, the city streets, should be a thing of the past. The city that will progress will be the city that has provided convenient municipal parking lots for the return of the automobile.

The available traffic lanes on city streets should no longer be restricted by parking at the curb. There are tax-delinquent properties close to the business, industrial, and shopping districts in most cities, already in the hands of municipalities, or which can be acquired at very little expense at the next tax sale. These should be purchased at once, just as right-of-way for the express highways to be built through cities by state and county authorities should be bought promptly so that finished plans can be made. It has been suggested also that if outright purchase of such tax-delinquent property is impossible, then a lease can be arranged with the owner at a rate which will liquidate the tax debt over a period of years.

For special study in the preparation of suitable parking areas, we recommend "Urban Highway Routes and Parking Facilities" published by the Texas State Highway Department as Bulletin 10, January, 1942, and "The Parking Problem—A Library Research," published by The Eno Foundation for Highway Traffic Control, Inc., Saugatuck, Conn.

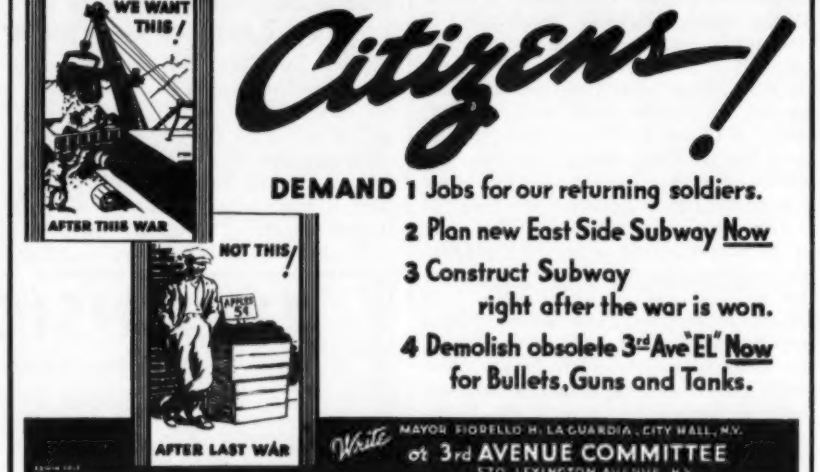
There is little doubt that proper street lighting has saved many lives in cities and should be continued as a post-war project everywhere. According to one writer, "To completely and adequately light an average city, an expenditure of about $2 per capita annually will be needed to cover the amortization charges and operation. Modern traffic safety lighting on the main thoroughfares costs from $2,500 to $10,000 per mile for installation, depending on whether wire is overhead or underground, and on the ornamentation and elaborateness of the system; and $800 to $3,000 per mile for annual operation, without including investment amortization."

Tunnels and Subways

Tunnel and subway construction will be a reasonably important post-war activity of considerable interest to contractors. The 9,635-foot Narrows Vehicular Tunnel between Staten Island and Brooklyn, mentioned above, is the largest tunnel project at present in the active design stage, while resumption of work on the Brooklyn-Battery Tunnel will add another to the post-war projects of this type. The 4,000-foot Pittsburgh, Pa., traffic tunnel is still another in this category.

New York City, the subway center of the country, will undoubtedly embark on another subway project. The removal of the old elevated railway structure from Second Avenue so greatly improved the character of that thoroughfare that the activities of the Third Avenue Committee of substantial citizens were further stimulated to secure the elimination of the Third Avenue "El". This committee has advocated this for a considerable time, and its numerous appeals to the Board of Transportation of the City of New York and to various city officials resulted in the approval of a budgetary allowance of $200,000 by the City Planning Commission, at the request of the Board of Transportation, for planning a new Second Avenue-Bronx subway. This subway, which will run the length of Second Avenue and have three branches in the Bronx, is estimated to cost a total of $500,000,000, in five annual installments of $100,000,000 each. The completion of this much-needed transit improvement would make possible the demolition of the Third Avenue elevated structure which is being sought by the Third Avenue Committee. The accompanying poster in striking red, white, and blue has been widely displayed in Second and Third Avenue

(*Concluded on next page*)



This poster is prominently displayed in the neighborhood of Third Avenue, New York City, to stimulate interest in needed civic improvement.

Variety of City Work Can Aid Employment

(*Continued from preceding page*)

shops to stimulate the campaign for the removal of the Third Avenue elevated.

Sanitation

Even though PWA and WPA built millions of dollars worth of water-supply and purification projects, sewers and sewage-treatment plants, refuse incinerators and other sanitary works, cities large and small are daily recording projects of this character for post-war construction. There are 13,350 water works in the United States to serve the national population of 131,669,275 in the 13,288 incorporated places of less than 2,500, many of the small unincorporated places, and the 3,464 cities from 2,500 to 7,454,995 population. To catch up with the deferred maintenance and needed construction programs of these vital utilities, much planning, careful design, and a large volume of construction will be needed.

The report of the Committee on Post-War Activities of the New England Water Works Association, under the chairmanship of E. Sherman Chase, sets up a program for water-works officials. The items referring particularly to construction include: investigations of the condition of water-works systems with respect to need for repairs and overhauling; reinforcement of distribution systems; replacement of undersized mains by mains of adequate capacity; provision for increased storage on distribution systems, development of additional sources of supply in cases where existing supplies are inadequate; major improvements such as new shops, new pumping stations, duplicate supply mains, filter plants, and other similar work.

Much the same situation and type of program holds in the sewerage and sewage-treatment field, and many cities are planning the construction of incinerators for the quick and assured sanitary disposal of garbage and rubbish.

The least discussed municipal sanitary facility in recent years has been the comfort station, due in large measure to the ever-present gas station with its certified rest rooms. Cities should give more consideration to provision for comfort stations throughout the community, particularly in the heavy shopping, business, and industrial areas. This is a field of post-war construction which should be more fully explored.

During the three-month period April-June, 1943, post-war water-works projects totaling $99,349,895 in cities from 2,000 to 1,600,000 population have come to our attention. In the same period in the sewerage and sewage-treatment plant field, reported post-war projects totaled $92,253,500 from cities between 1,000 and 7,500,000 population.

Municipal Utilities

The two primary municipal utilities which can produce a considerable volume of post-war construction are municipal power plants and district heating. Municipal power plants have been operating successfully for many years and invariably result in a measurable profit for the city. Where expansion is necessary to take care of an increased load, plant profits are able to finance new construction and the purchase of equipment, making this a fertile field for post-war operations.

The field of district heating has not appealed generally to municipalities. With improved insulation of homes becoming more general and the temperature controlled by thermostats, heat need not run rampant. Cities should give serious consideration to zone heating projects for maximum efficiency and economy in public buildings, schools, and for apartment houses and even single residences. These would be particularly economical in areas where coal is cheap and would result in better combustion of the local fuel and less smoke in soft-coal areas.

Municipal Buildings

The field of municipal buildings offers a very wide opportunity for the general contractor. Undoubtedly there will be an increase in the number of municipal auditoriums and community centers built as war memorials, while schools, hospitals, and health centers will represent the sociological needs of the community. Municipal markets have already been built in many cities, and New York has started the plans for a new terminal market to cost $40,000,000.

In the smaller communities, where improved facilities are needed for fire stations, police stations, and city halls, greater consideration should be given to combining these under one roof to centralize municipal administration and services.

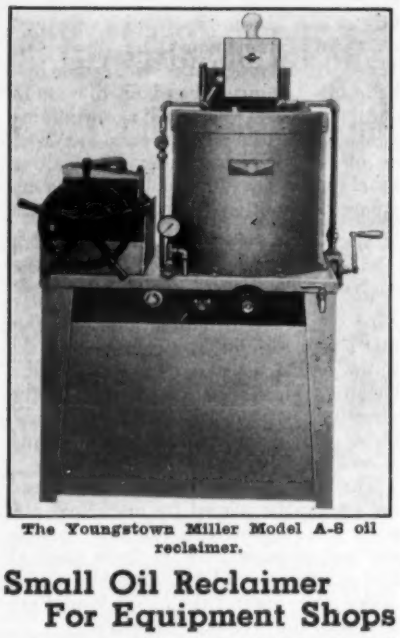
Parks and Recreation

If we are to improve the general welfare of our cities, opportunities for outdoor recreation must be increased. These will include parks with tennis and badminton courts, baseball diamonds, and picnic areas, as well as swimming pools. Cities located on streams, lakes, or on salt water can develop bathing beaches and boat or yacht basins as another contribution to recreational facilities.

Airports

W. A. Patterson, President, United Air Lines, has called attention to the fact that a city without an airport will in the future be like a seaboard town without a harbor. This applies not only to the potential service of commercial air-transport companies but to private flying as well.

The subject of domestic aviation and the part to be played by municipal airports was discussed in full in an article starting on page 2 of the June issue of CONTRACTORS AND ENGINEERS MONTHLY, under the main title "Post-War Construction for Aviation Industry".



The Youngstown Miller Model A-8 oil reclaimer.

Small Oil Reclaimer For Equipment Shops

A new small-capacity lubricating-oil reclaimer, designed especially for small organizations having their own fleet of trucks and motor cars, and particularly adapted to district and county garages, is being made by the Youngstown Miller Co., Sandusky, Ohio. The new Model A-8 oil reclaimer will clean 8 gallons of dirty oil in 70 to 90 minutes and will handle 2,500 gallons of waste lubricating oil per year when operated only once a day. The manufacturer points out that, based on average prices for new oil, the reclamation of this quantity will make the machine a profitable investment.

The Youngstown Miller oil reclaimer has a two-stage filter press, is semi-automatic, operates under thermostatic control, and utilizes common refinery earths available in the open market. The man operating the machine can do so incident to his regular work. These machines in the larger sizes are in wide service reclaiming oils from diesel engines, aircraft engines, hydraulic machines, ice machines, vacuum pumps, gasoline engines, and similar installations.

Complete information on the Model A-8 unit may be secured direct from the manufacturer by mentioning this text.

Traffic Drops 54 Per Cent

Traffic on rural roads in the East has decreased in the six months from December through May to less than half of pre-war normal, the Public Roads Administration reports. In March, eastern traffic was 52 per cent of normal, but other monthly figures range from 45 to 48, with an average of 46 per cent of normal. In the western area, rationed since December 1, 1942, traffic has settled down to less than two-thirds of pre-war normal.

Motor-fuel tax collections totaled more than $31,000,000 in 28 states in May and indicated that total urban and rural traffic in the East used about 52 per cent as much gasoline in April as in the same month in 1941.

New Gypsum Board For Concrete Forms

Essential wartime construction and lumber shortages have fostered the development of another replacement for scarce lumber, that of gypsum Formboard for use in concrete forms. This Formboard was developed in the research laboratories of the National Gypsum Co., Buffalo, N. Y., and although its use is still in the experimental stage, it is reported that it turns out better looking concrete and saves labor, inasmuch as it does not have to be oiled. Formboard is specially coated so that the concrete will not adhere to the paper surface of the gypsum board.

Gypsum exterior board has been used on many wartime construction jobs throughout the country, to replace hard-to-get lumber. Treated on one side with green covering, it is valuable in war construction since the dark green blends with the landscape for natural camouflage.

Further information on the use of Formboard for concrete forms and of gypsum board for other construction services may be secured by interested contractors and engineers direct from the National Gypsum Co.

No Grade Crossings On New Ohio Project

Brotherton Road and Erie Ave. Project in Cincinnati Connecting Link Between Industrial and Home Areas

(*Photos on page* 60)

A $459,076.72 Federal-Aid project, FAGN-68-A(1), has recently been completed within the city of Cincinnati, Ohio, to provide quicker and safer access to the great industrial areas from the satelite residential sections of Oakley, Madisonville and Mariemont. This Erie Avenue-Brotherton Road project relocates both of these major highways, thus eliminating a railroad grade crossing on each. The project is roughly a sprawling "X" with two of the three bridges on the new Erie Avenue section which forms an east-west axis at the center and then leads off in a northeast direction to Madisonville as a 62-foot highway of four 10-foot and two 11-foot lanes, all uniform 8-inch reinforced-concrete slabs. The four 10-foot lanes are carried throughout while the two outside lanes vary from the 11-foot maximum down to 8 feet 7 inches.

The connecting link to the northwest from the new Erie Avenue Road is via Rosslyn Drive to Brotherton Road which leads to Oakley. Rosslyn Drive is 40 feet wide with a 9-inch uniform unreinforced slab and a curb 6 inches high and 7 inches wide. A 44-foot reinforced-concrete bridge carries Rosslyn Drive over Duck Creek. Murray Avenue leading to the southeast 1½ miles to Mariemont has two 10-foot lanes of 9-inch uniform slab with a 2-foot 10-inch mall and 6-inch curbs.

Grade-Separation Structures

The two main bridges on the project are about 300 feet apart on Erie Avenue. The westerly structure, 156 feet 6 inches long, spans the Pennsylvania Railroad, while the second is a reinforced-concrete structure of the same length carrying the new Erie Avenue over Red Bank Road which is a 40-foot reinforced-concrete road with 9-inch uniform slabs.

The original plans for these two structures were based on carrying a double-track street-railway line, but when the Lend-Lease requirements of our Allies caused a scarcity of steel, it was decided to omit the tracks. The two bridges were redesigned, eliminating the steel rails and the live load, saving considerable steel and concrete. Priorities for buses were acquired by the Cincinnati Street Railway Co. but, after the shortage of rubber developed, it was found that buses could not be purchased. By this time, however, the redesigned bridges had been built to a point where it was impossible to change back to the earlier designs for carrying the street-railway tracks. This unfortunate situation was overcome by carrying a single track across each of the bridges on top of the slab, with sand and gravel ballast retained between the ties and prevented from washing out by a 2 x 8 plank nailed along the ends of the ties. This mode of transportation will be continued for the duration and then, when new buses are available, the street railway company will convert to bus service.

Quantities

The major quantities for the Brotherton Road and Erie Avenue grade-separation project were as follows:

PAVEMENT	
9-inch uniform plain-concrete pavement	31,701.8 sq. yds.
8-inch uniform plain-concrete pavement	335.1 sq. yds.
7-inch uniform plain-concrete pavement	451.3 sq. yds.
6-inch uniform unreinforced black concrete pavement	193.2 sq. yds.
Concrete curb	11,712.2 lin.ft.
5-inch concrete sidewalk	42,086. sq. ft.
Reinforced-concrete access steps	486.7 cu. yds.
EXCAVATION AND EMBANKMENT	
Excavation	151,841 cu. yds.
Embankment, with 20 per cent allowance for shrinkage	172,659 cu. yds.
Channel excavation	678 cu. yds.
Borrow, estimated	20,140 cu. yds.
Retaining wall, concrete	659.4 cu. yds.
BRIDGE QUANTITIES	
Excavation for structures	1,918 cu. yds.
Channel excavation	678 cu. yds.
Class E concrete for footers	642 cu. yds.
Class E concrete for walls	974 cu. yds.
Class C concrete for superstructure	918 cu. yds.
Reinforcing steel	386,500 lbs.
Structural steel	823,500 lbs.
12-inch cast-in-place concrete piling	11,900 lin. ft.
12-inch timber piling	5,100 lin. ft.

C. & E. M. Photo

Red tape landed the street railway tracks and ballast on top of the Red Bank Road highway bridge at Cincinnati, Ohio.

A considerable amount of 4-inch to

(*Concluded on page* 53)

The wood-pile bent framework of Chickahominy Dam. At left, flattening the vertical piles for bolting the batter piles to give greater lateral strength, and, above, the pile bents completed, ready for the concrete deck.

Method of Building New Dam in Virginia

(*Continued from page* 13)

the bent.

Clamp caps composed of a 6 x 12-inch plank on end on either side of each pile bent were completely imbedded in concrete over the entire 750 feet of spillway. Teco connectors were used for all of the clamp caps, and grids for all connections between other lumber and piles.

The effective face of the dam was composed of Wakefield wood sheet piling up to a maximum length of 20 feet and, in the deeper sections, up to 38-foot Bethlehem ZP-302 steel sheet piling, purchased second-hand, was used. Both of these were driven to give an assured cut-off to prevent leakage beneath the dam.

Concreting

The contractor elected to mix his own concrete at the site as the job was too far from a ready-mix plant for an economical haul, and further it would have been necessary to build the final access road from the main highway at a much earlier date to handle the heavy truck-mixers. The concrete for the 2-foot deck, which has a center to center span of 10 feet between the pile bents, was mixed on the shore in a 2-bag mixer and buggied as far as economical on a runway laid across the bents. Then the mixing outfit was set up on the completed dike at the opposite end of the dam and the concrete mixed and buggied in from there. The length of pour was controlled almost entirely by the character of the tides as work could be done only at low tides.

The forms for the concrete deck were built up by nailing 4 x 12-inch stringers to the piles and then swinging intermediate stringers by bolting through 6 x 12 and 4 x 12 lumber and carrying a deck of 2-inch lumber on top of these stringers to serve as the forms which necessarily were left in place.

The concrete cap was carried down to the elevation of the batter piles on the downstream side and was fully reinforced.

Equipment and Methods

The contractor used floating equipment for all of the work on the dam except the actual placing of concrete. A 22 x 70-foot wood barge on which an Erie steam crane with a 55-foot boom was mounted was used for handling piles, operating a clamshell bucket, and for general service. A pile driver with 55-foot leads and equipped with Lidgerwood hoists was mounted on a 25 x 60-foot barge and used for driving the vertical piles. The batter piles were driven by a Bucyrus-Erie steam crane with an 85-foot boom, using a No. 2 Vulcan steam hammer. This outfit was carried on a 35 x 110-foot wood barge.

The wood piles were hauled to the site by trucks as were all the timber and the steel piles. The wood piles were rolled overboard and poled out to the pile driver. The steel was loaded from the bank onto the deck of the derrick barge and carried out to the pile-driving rig.

Only pile driving and the fill on th swamp could be handled a other than low water. The upper end of the cross braces were fastened during low water, and the diver did the remaining work at any stage of the tide. The diver worked in water up to 22 feet deep in setting the braces, using a Chicago-Pneumatic air auger supplied with air by the same Chicago-Pneumatic portable 120-foot compressor which furnished air for the diver.

(*Concluded on next page*)

Wood and Concrete Water-Supply Dam

(*Continued from preceding page*)

In addition to the diver's attendant and three helpers on the diving barge, one man was stationed at all times at the compressor to start it should anything cause a stoppage in the delivery of air to the diver.

The contractor used an old pile-driver bed to span the boat lock at the shore end opposite the dike to furnish access to the work without making it necessary to use a boat after the pile bents had been driven.

Quantities

The major quantities involved in the construction of the wood-pile and concrete dam across the Chickahominy River are as follows:

Wood piles	24,000 feet
Clamp caps	30 MBM
Braces	50 MBM
Stringers	90 MBM
Decking	90 MBM
Facing	60 MBM
Wood sheet piling (Steel sheet piling was used in the deep sections only)	180 MBM
Concrete deck	1,000 cubic yards

Personnel

The Chickahominy River Dam was built under the direction of Reeves Newsom and E. H. Aldrich, of Newsom & Aldrich, Engineer-Consultants, New York, N. Y., and Williamsburg, Va. J. W. Hamilton was Inspector for the engineers and W. T. Watts was Superintendent for Boney Construction Co., Norfolk, Va., contractor for this work.

Cleaning Equipment Essential to Its Care

One of the fundamental phases of equipment care and maintenance is that of cleaning machines and their parts. Cleaning itself greatly adds to the life of equipment and is also necessary to a thorough check for weakness and wear which are often concealed by dirt and grease. As a result, more and more attention is being given to equipment-cleaning materials and methods in the shops and garages of contractors and state and county highway departments.

One of the available equipment cleaning outfits is the Dee Tee vapor cleaner for internal degreasing and drying. This cleaner, using Dee-Solv solvent, creates a constant flow of hot clean vapors into a transmission, differential, gear case or other part, where the vapors penetrate through the old worn lubricant to the metal, condensing on the colder metal, washing and rinsing all inside surfaces free of grease, dirt and chips. Due to the high temperature of the solvent vapor, all moisture due to condensation is completely removed, and the parts and housing are left perfectly dry and clean.

The outfit consists of a vapor generator tank approximately 30 inches high x 24 inches in diameter, with all inside surfaces zinc sprayed, and a capacity of 35 gallons. Dee-Solv solvent in the tank is heated by steam coils, converted into hot vapor at low pressure, and passes through the main control valve into the vapor manifold which is equipped with a number of outlets as required, each outlet having a vapor control valve and a 6-foot long, or longer, x ½-inch inside-diameter seamless flexible bronze tubing. At the end of each hose is a vapor outlet nozzle equipped with a set of adapter plugs for connecting to the housing or part being cleaned.

The clean hot Dee-Solv, which is a non-flammable non-explosive chlorinated hydrocarbon solvent stabilized for metal cleaning, flows in vapor form through the tubing into the housing and around the gears or parts, cleaning, washing and drying the metal thoroughly.

In addition to the Model 35-S described above, the Dee Tee vapor cleaner is available in other standard models to meet varying requirements. Further details on this equipment cleaning outfit is contained in literature which may be secured direct from Circo Products Co., 2835 Chester Ave., Cleveland, Ohio, by referring to this descriptive text.

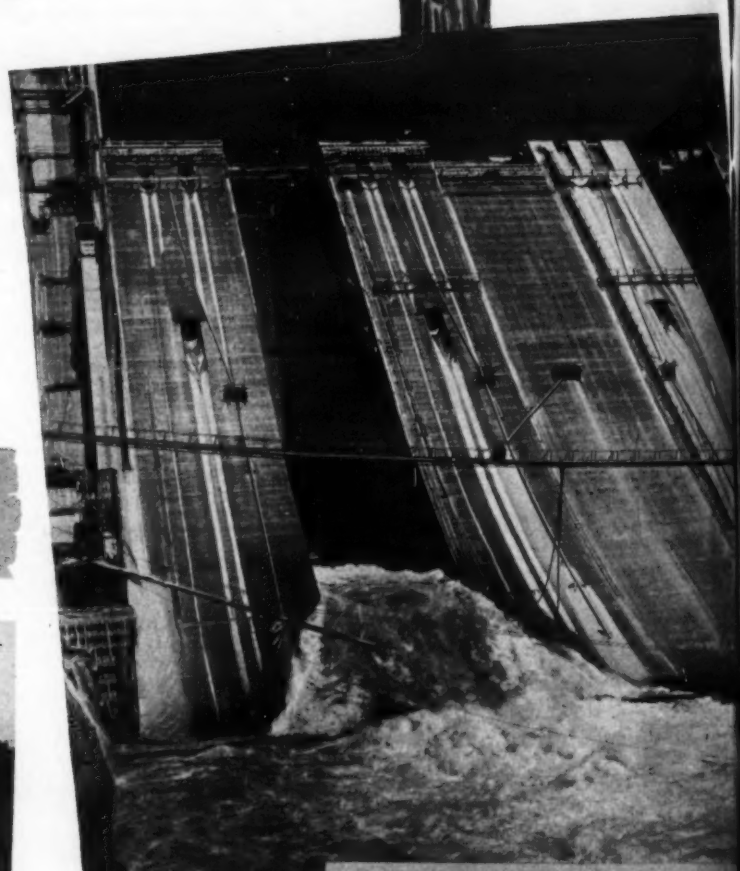
Less Use of Cut-Back Asphalt Is Requested

According to Walter Hochuli, Director of Marketing, Petroleum Administration for War, there is a growing shortage of naphtha and kerosene distillates which are used in the manufacture of cut-back asphalts. In order to conserve these distillates, it is requested that asphalt cements and emulsified asphalts be used as much as practicable on public highways and streets, instead of cut-back asphalts. The use of emulsified asphalt is urged particularly on projects requiring dust palliative treatment.

Field Pho
Tell The

HYDRO-POWER. At the Wolfe Creek Dam hydro-electric project near Somerset, Ky., an Osgood dragline loads an Athey wagon pulled by a D8 Caterpillar tractor.

BIG INCH. Construction of the 24-inch oil pipe line for War Emergency Pipelines, Inc. The line will deliver oil from Longview, Texas, to Norris City, Ill.



DIVERSION. At left, the Sacramento River section of Shasta Dam [illegible] each time emerging at a high elevation [illegible] This process will continue until the reservoir [illegible] diversion tunnel which will handle the [illegible] tion period. At right, workmen in the [illegible] forms preparatory to the next pour.

WEEDS. One of the summer maintenance operations in Franklin County, Ohio, is weed mowing along the roads.

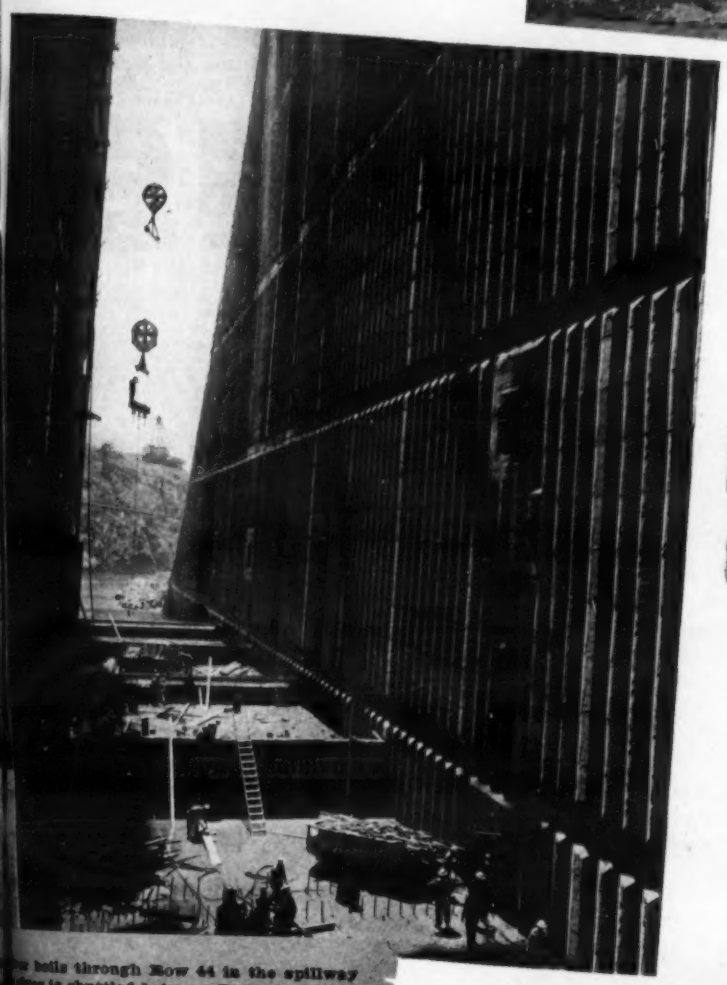
SEABEES, the newest fighting-building arm of the U. S. Navy, set off a blast as they clear a road through a heavily wooded section as part of their training for construction activities, such as building roads, yards, docks and bases, outside the continental United States.

Official U. S. Navy Photo

RELOCATION of Route 40 in Pennsylvania, showing a Caterpillar with LeTourneau bulldozer and Rooter at work near Somerfield. The valley below and the few remaining buildings will be flooded by the reservoir created by one of the dams in the U.S.E.D. flood-control program.

Photos ...er Stories

GRAVEL being dredged from the Russian River near Healdsburg, Calif., by a Bucyrus-Monighan 6-cubic yard dragline and loaded to a bottom-dump Euclid. The average load hauled to the gravel plant is 15 cubic yards.



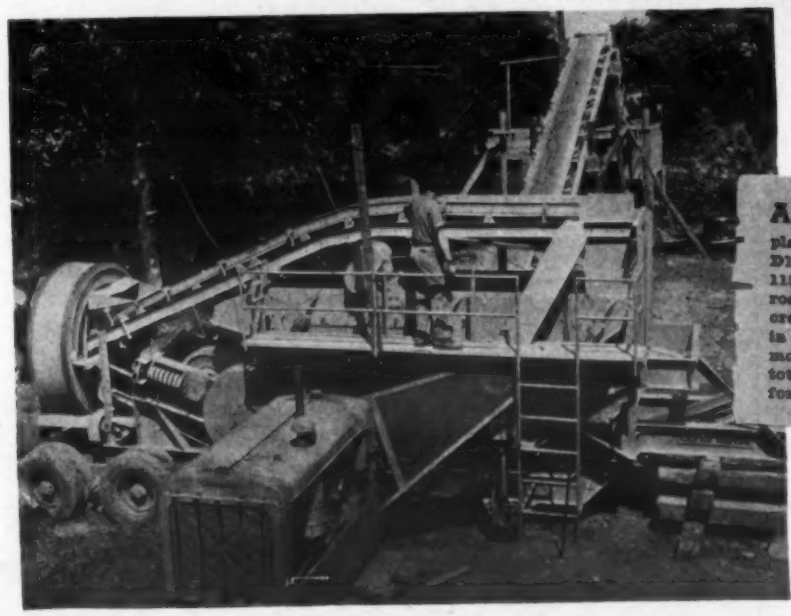
...s through Bow 44 in the spillway ...is shuttled between Bows 40 and 44. ...is added to the alternate low rows. ...by the dam rises to the level of the ...low for the remainder of the construc... ...debris left by the river and set ...

Bureau of Reclamation Photos

NAVAL DEPOT. A Euclid crawler wagon pulled by a D7 tractor delivers a load of dirt at the Cheatham Annex of the Naval Supply Depot.

Official U. S. Navy Photo

FLOOD CONTROL. Widening and deepening the channel of a stream which creates a flood hazard to important Pennsylvania war plants.



AIR BASE. A Cedarapids crushing plant powered by a Caterpillar D12,000 engine which produced 112,000 tons of stabilized-base road and 72,000 tons of concrete aggregate for an air base in Kansas. In less than seven months, this plant produced a total of 415,000 tons of material for vital war construction jobs.

How to Repair Tires Of Synthetic Rubber

The Tire Division of the United States Rubber Co., New York City, pointing out that soon synthetic tires will be an important factor in the field, has issued rules by which synthetic tires may be repaired using only regular repair materials. The steps, with which all garage and repair men should be familiar, are as follows:

1. *Preparation.* Tires must be thoroughly dry. Then prepare the area surrounding the injury exactly as on natural rubber tires, *except* for the tread skive, which should be at a 60-degree angle instead of 45 degrees. The tread should be buffed carefully with a rasp rather than a wire wheel because synthetics heat rapidly and scorch from friction, giving poor adhesion. Buff the band ply and roughen the carcass cavity with a rasp as in standard practice.

2. *Cementing.* Cement the buffed area with regular vulcanizing cement, and allow the cement to dry thoroughly before proceeding.

3. *Building Repair.* Use regular repair materials, and fill up the carcass cavity with padding stock which, when cured, is less resilient than cushion gum, thereby reducing friction heat. When building in the tread plug, cover the entire tread skive with a layer of padding stock. This improves the bond between the new tread stock and the synthetic tread. The tread plug is then built in with regular black tread gum.

4. *Curing.* The section molds must be maintained at from 35 pounds steam (281 degrees F) to 40 pounds steam (287 degrees F). The latter is the absolute maximum, as high temperatures harm cured synthetic rubber. Curing time is the same for synthetics as for natural rubber tires, when using regular repair materials.

5. *Handling After Cure.* The bond between the cured repair and the synthetic tire is not strong until cooled; therefore, remove the tire from the mold without strain or distortion, and allow it to cool without unnecessary handling. Avoid spreading the area of repair when removing the section bag. Instead, move the bag around to an unrepaired section of the tire and then spread so as not to distort the repair. Don't finish, buff, or clean up the tread surface until the tire has cooled off.

Never has the proper care of equipment been so important. The machines you now have must last for the duration, so take care of them.

Dynamite Technician For du Pont Co. Dies

Samuel Reid Russell, of the Explosives Dept., E. I. du Pont de Nemours & Co., died suddenly last month in Easton, Penna., at the age of 63. Mr. Russell, who had been with the du Pont organization since 1907, was a leading authority on all kinds of quarry and marine blasting, and particularly skilled in precision dynamiting.

He had perfected a method of tunnel blasting in open quarries, and helped develop new methods for harbor blasting, particularly for cleaning out big harbors. He was consultant to many of the country's largest engineering and contracting firms on their biggest projects. As a leading dynamite expert, he addressed engineering societies and other organizations all over the country, and also wrote numerous articles on the technique of dynamite blasting for trade publications.

One of Mr. Russell's most spectacular accomplishments in the field of precision blasting was the felling of a river dam which had been built upright on one bank. By accurate blasting of a retaining wall, he dropped the pre-constructed dam into place on a prepared base, with only inches to spare on either side of the dam.

New Crusher Bulletin

The features of construction and operation of the complete line of Austin-Western roller-bearing jaw crushers are described and clearly illustrated in a new 8½ x 11 8-page bulletin just released by the Austin-Western Road Machinery Co., Aurora, Ill. The bulletin also includes large cross-section views of complete crushers, bearings, etc., and gives a comprehensive conception of detailed design and performance. Operational data, specifications and dimensions are also provided and arranged for easy reference.

This Bulletin 1960 is available at any Austin-Western distributor or may be obtained by writing the manufacturer.

C. & E. M. Photo

Close-up of the Jaeger finishing machine on runway paving, equipped with a Jackson tube vibrator, ahead of the strike-off of the two-screed machine.

Two Paving Outfits Speed Runway Work

(*Continued from page* 1)

effected by the use of a shaped cap through which the pins were driven. Usually the connecting piece between the pins over the top of the joint is merely a plate, but in this case, it was shaped to fit over the top of the joint cap and drop down about 1½ inches on each side where the pins went through.

The center steel across the longitudinal joint consisted of ½-inch round deformed bars 24 inches long and spaced 30 inches along the slab. These were set at the same time as the center steel with a wooden template to insure its being in the exact center of the slab under the slot cut later by the Cleft-Plane machine. The three men who set the steel were also responsible for the oiling of the forms after the placing of the metal key on the forms to provide the lock between adjacent slabs of pavement.

The Two Pavers

The mixing of the concrete was done by a pair of Koehring 27-E pavers, one on each side of the slab. One ran on the grade outside the forms while the other ran on planks on a 25-foot slab of concrete already poured. One man at each skip dumped the batches while one man between the forms handled the water line for the pavers, sprinkled the grade, and moved the planks ahead as required. The water for mixing was taken from the post supply, with valves every 200 feet. The water line was connected by hose to the nearer paver and then carried across from the other side of the paver to the second paver. This hose had to be lifted over the center steel at every move.

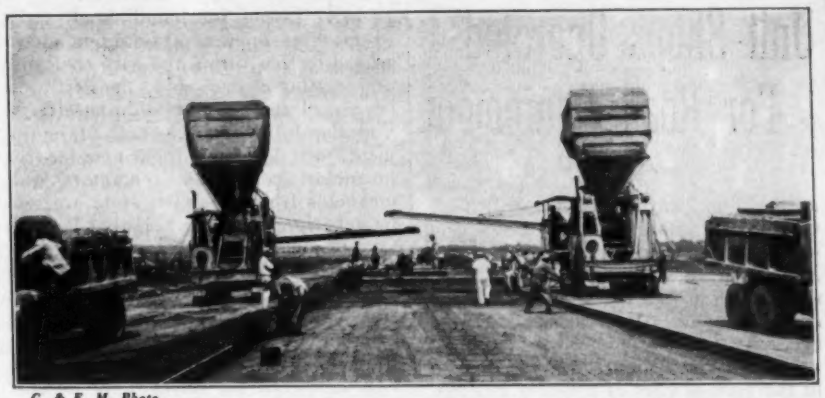
There were four puddlers in front of the Jaeger-Lakewood 2-screed finishing machine which was equipped with a Jackson tube vibrator ahead of the first screed.

Finishing and Curing

Following the finishing machine, a Cleft-Plane machine cut the slot for the center joint and the two men operating the machine cut the slot for the contraction or dummy joints at 20-foot intervals. Premoulded 2 x ⅛-inch ribbon in rolls was used for the center joint and steel strips were set in the dummy joints.

A Koehring Longitudinal Finisher came next, followed by four hand finishers using 10-foot aluminum drag straight-edges and then 5-foot x 6-inch long-handled floats. After the surface had been adjusted, a heavy burlap drag was pulled over it to give it a uniform finish. The burlap had a heavy rope sewed into the front of it to make it easier to pull and also to save the extra strain on material that cannot be replaced easily at the present time.

Two of the finishers pulled the caps over the expansion joints and edged them and also lifted the dummy-joint steel and edged the slots. The slabs were cured with a spray of Aquastatic concrete-curing compound to seal in the water in the mix to permit a complete cure without the addition of curing water.



C. & E. M. Photo

Coming down the last lap of the runway, pouring a 25-foot strip with two Koehring 27-E concrete pavers.

The 150-foot wide concrete runways 5,500 feet in length at this air field were constructed by contract under the direction of the U. S. Engineer Department.

In the interest of national security, mention of the location of and personnel connected with U. S. Army construction is omitted.

Unit Shops Operated For Road Equipment

(*Continued from page 2*)

as the shop is fully equipped with a Crescent Machine Co. rig with band saw, saw table and planer, all driven as a unit by a single motor. A large two-sided rolling stand with wire-screen doors contains all the carpenter tools necessary for the hand work in the department. There are all sizes of bits to fit the various sizes of reflector buttons, saws, hammers, and even heavy wrenches for installing signs on trees, if necessary, with lag screws.

A small compact paint shop or booth makes fast painting of all types of signs possible. They are mounted on a frame and spray-painted by a DeVilbiss spray outfit in short order. The heavy suction of a fan at the back of the booth makes the use of an aspirator or goggles for the operator unnecessary, adding greatly to speed as well as comfort. The signs, as soon as painted, are laid in frames which hold two signs and are left until dry before any other work is done on them. The next step for the embossed metal signs is to roll the black lettering onto the sign. The wooden signs go to the lettering artist who does the special signs and the standard temporary signs for detours and emergency work. Most of the metal signs are stored in cartons to protect them until they are shipped into the field. In line with the conservation efforts of the country today, orders have been issued that all cartons are to be returned to the headquarters shop for re-use.

The main shop on the second floor is particularly well laid out so that there is a minimum of interference. One feature that has worked very well is the use of a single dumb waiter, or small elevator, for the handling of all parts deliveries from the stock room on the first floor to the repair shop above. The requisitions are sent down on the elevator, which operates by push buttons, and the parts come up quickly.

The idea mentioned above of using wire-screen doors on storage cabinets is used also in the main shop for the stock of hand tools, like electric drills, special tools and other small equipment, all of which are charged to the Chief Mechanic. These two cabinets are located on either side of the parts elevator opening. At the north end of the shop is the office for the Chief Mechanic. Just outside his office, and close to the set of benches along the east wall, is a closet for a Kwik-Way valve refacer equipped with a G-E motor. Adjacent is a Champion A-C spark-plug cleaner, and then down the east wall under the large windows are four Hallowell steel work benches for the mechanics, each with a heavy-duty vise. In addition, there are several portable steel benches of the same make in which the mechanics keep their own hand tools. Along the wall are two Sioux 7-inch grinders and buffers, a Sunnen pin hole grinder, a Stiles brake-lining machine, a Sioux drill press, an arbor press and a Weaver 42-inch 60-ton press.

The welding layout consists of an acetylene outfit with Smith tips, an anvil and preheating furnace. Around the corner is a long-arm Singer sewing machine used for making canvas seat covers for equipment. Against the south wall is a Unitron Rectifier with a 2-level shop-built stand 10 feet long to hold the batteries being charged. In front of the stand is the pair of lifts used for raising the machines that are being lubricated. The Alemite pressure lubricating unit is located under the ramp on the first floor with the lubricants piped to the second floor for convenience.

The machine shop in the southeast corner of the second floor is a model of effective layout for handling all types of machine operation. Going in clockwise direction within the wire enclosure and starting at the gate in the northwest corner of the machine shop itself, we find the following selection of equipment: an Allen equipment tester for magnetos, coils and generators (all magnetos from the entire state are sent in here for testing); a Hill, Clarke & Co. 12-inch x 6-foot lathe; a Niles-Bement-Pond shaper with a 24-inch stroke and automatic carriage speed and hand feed; a Van Norman No. 900 cylinder boring unit; a Master lathe converter that the machinist said he would not sell for many times its cost if another could not be purchased to replace it; a South Bend 18-inch x 8-foot lathe; and a Prentice lathe of the same size; a 10-foot Hallowell steel bench; a Heald No. 55 cylinder grinder; a Becker No. 3 vertical milling machine; a Kwik-Way Model H piston turning and grinding machine; and a Peerless power hack saw. All of the equipment in the machine shop is run by jack shafts from a single General Electric 10-hp motor. Carefully set under a bench is a large boring bar which was purchased for work on the bearings of the old Liberty motors, many of which are still in the service of the department. It is also used on other heavy-duty trucks and Caterpillar tractors.

At the center of the shop is a 21-inch Buffalo drill press.

Other Services

A locker room with individual steel lockers is provided for the men in the shop, in the northwest corner of the

(*Concluded on next page*)

Services, Car Pool At Missouri Garage

(*Continued from preceding page*)

second floor shop. It is supplied with showers, toilets and wash basins.

A heavy storage section is located on the second floor at the northeast corner where paint, tool steel and heavy maintenance tools as well as small tools are stored. Above this is a third floor where the State Highway Department stores its records, old correspondence and other papers.

All of the floors of the garage are painted with Pittsburgh Plate Glass Co. Mule Hide gray paint, and the same is used throughout all the garages in state service. The shop floor is washed every night and the garage floor is swept twice daily and washed every two weeks. They present a neat shiny appearance and show little signs of wear.

Fire doors are installed between the sign shop and the repair shop and at all other places where there might be danger of fire originating in one department and spreading to another. The garage is also well protected throughout with acid-and-soda fire extinguishers. A heavy-duty freight elevator from the first floor in the parts department opens directly onto a stairway landing on the second floor adjacent to the heavy-materials storage section.

Near the ramp on the second floor is a Weaver automatic wheel-alignment indicator and nearby on the wall are stored the Bear wheel aligners and template. The shop is so well equipped for all types of work on the motor equipment of the State Highway Department that only body work is sent outside the shop.

The Parts Department

The stock of parts and materials is well protected against theft by a heavy steel gate at the delivery entrance where trucks may back up and unload directly into the store room. This department is completely equipped with metal bins with every item recorded on the perpetual inventory which is balanced every month. Parts and materials, including all the forms, stationery and office supplies as well as the usual stock of parts and materials that a motor shop carries, are packed and shipped from here to the various division garages and offices over the entire state. A stock of over 5,000 items is carried on the stock cards.

Ground Floor

The ground floor, outside the Parts Department, has storage space for all the cars used by the Department from the central offices in Jefferson City. At present, because of the need for conserving tires, a large portion of the passenger cars and pick-up trucks have been stripped of their tires and are stored on this floor on the rims, and others are in the yard outside with the rims resting on old metal plates to protect them. All passenger cars, not just some but *all*, are pooled and assigned for each individual need, and charged to that official and his department on a mileage basis, by the Superintendent of Equipment. A statement is rendered each engineer of the Department each month showing the distance he has traveled in the assigned cars and the total charges to him for the use of cars.

Located under the ramp with the lubrication containers is a Curtis garage compressor for the use of the entire garage for air for the lubrication outfit as well as tires and other services, except the paint spray machine in the sign shop.

A small supplementary garage at the south end of the first floor was originally built for the use of Division 5, but now is used for minor repairs and adjustments and contains the blacksmith shop.

Both front doors of the garage are opened by button control from the Service Man's office and allow a full 12-foot high x 14-foot wide entrance for equipment. The doors are suspended and run on rollers.

The Yard

The yard at the south end of the garage is enclosed with heavy wire fencing and a high concrete retaining wall at the west end. It contains sheds for the passenger cars stored outside without their tires, and several enclosed sheds for the Bridge and Materials Departments. A very large concrete loading ramp is built alongside the railroad spur on which coal is brought in for the separate heating plant located in the yard. Steam pipes run to the unit heaters distributed through the garage. A carload-capacity gasoline tank is located in the yard and another underground tank close to the service pump at the garage.

Personnel

The State Highway Garage and Shops at Jefferson City are operated under the direction of R. P. Cummins, Superintendent of Equipment, and T. W. Johnson, Assistant Superintendent of Equipment. D. W. Campbell is Superintendent of the Headquarters Garage and Fred Heckel is Chief Mechanic. H. J. Mahoney is Stock Clerk and H. B. Rice is Garage Clerk.

Ohio Route Widened To Serve War Traffic

(*Continued from page 9*)

other for the asphalt weigh-bucket.

The plant is fully equipped with General Electric motors for each separate drive, and electricity was taken from the lines of the local electric utility. The capacity of the plant is 75 tons per hour, and a total of 26,000 tons of hot-mix with asphalt or tar was produced for these and other Hamilton and Clermont County projects on U. S. 52.

The specifications for the two stone aggregates, No. 3 and No. 46, are as follows:

No. 3 Gravel

Screen Opening	Total Passing
2-inch	100 per cent
1½-inch	80-95 per cent
1-inch	20-55 per cent
¾-inch	0-15 per cent

No. 46 Gravel

Screen Opening	Total Passing
1-inch	100 per cent
¾-inch	95-100 per cent
⅜-inch	65-90 per cent
No. 4	35-65 per cent
No. 8	0-15 per cent

The standard mix weighed 3,800 pounds per cubic yard. For the leveling and top courses 5.7 per cent of asphalt was used and 5 per cent of tar in the base widening course.

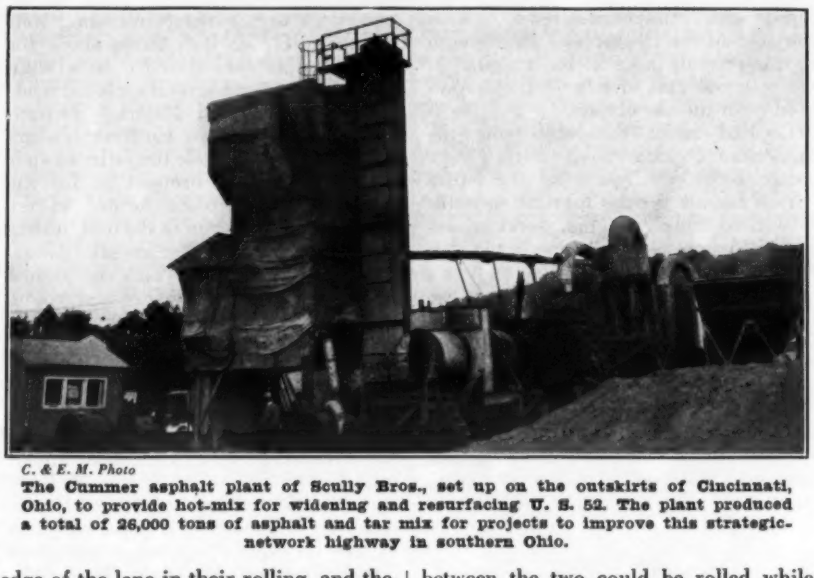
The Widening Strip

The widening strip was cut to a depth of 7½ inches below the surface of the existing pavement and in widths varying from 1 to 3 feet, using two Buckeye trench excavators mounted on trucks to cut the clean uniform trench. Following this, Lakewood 9-inch forms were set to delineate the outer edge of the widening strip and were braced at every joint with a 2 x 4 and a standard steel form pin. In this area a 1¼-inch insulation layer of crushed-stone dust was spread and thoroughly compacted by Buffalo-Springfield and Galion trench rollers having a unit compression equivalent to a 7-ton roller.

The base-widening hot-mix material was placed in the trench by a Galion spreader box which laid it down to the required depth. A total of three shovelers and two rakers were used for this operation and then the base-course material was compacted by two trench rollers. It was laid and compacted in two equal courses.

Leveling and Surfacing Courses

The leveling and surfacing courses were placed by an Adnun paver, using one dump man, one operator and two rakers. The strips were laid 11 feet wide and when the first strip was laid the 10-ton Buffalo-Springfield tandem rollers were kept 6 inches away from the inner edge of the lane in their rolling, and the second lane was laid as soon after the first as possible so that the closing joint between the two could be rolled while the material on both sides was still hot. This made a tight and uniform joint which could not be distinguished after the road was completed.



C. & E. M. Photo

The Cummer asphalt plant of Scully Bros., set up on the outskirts of Cincinnati, Ohio, to provide hot-mix for widening and resurfacing U. S. 52. The plant produced a total of 26,000 tons of asphalt and tar mix for projects to improve this strategic-network highway in southern Ohio.

Personnel

The contract for the 4.767 miles of widening strip and 22-foot pavement in Clermont County was awarded to Scully Bros. of Cincinnati, Ohio, on its bid of $70,541.68. The operations were in charge of Lee Scully, a cousin of the Scully brothers. For the Ohio Department of Highways, Hal G. Sours, Director, the work was in charge of S. A. Butterfield as Project Engineer.

New Wall Tire Chart

A new wall chart containing a truck and bus tire load and inflation table has just been prepared by the B. F. Goodrich Co., Akron, Ohio. One copy may be obtained free on request for posting in garages and repair shops by contractors and state and county highway engineers and equipment superintendents. Just mention CONTRACTORS AND ENGINEERS MONTHLY.

Members of England's Women's Land Army operate tractors on many land-clearing and general earth-moving jobs as well as on farms. Here an English lass manages a bulldozer and large Caterpillar diesel tractor like a veteran "cat skinner".

Get Down to Details In Post-War Plans

Detailed plans for post-war construction projects totaling $40 per capita for a year were urged by G. Donald Kennedy, Vice President, Automotive Safety Foundation, and Chairman, Committee on Post-War Construction, American Society of Civil Engineers, in a recent speech before the Governing and Advisory Boards of the Associated General Contractors of America. Mr. Kennedy pointed out that with few exceptions, cities and states are marking time on actual post-war planning, their plans being either long-range programs which cannot possibly be ready to start when jobs are needed after the war, or else a patch-work of desirable but unimportant jobs which fail entirely to embrace our real post-war need.

"Not all the financial questions for a large public works program can be settled right now," Mr. Kennedy said. "Not even the final extent of the program can be settled. But it seems to me that every city should be making blueprints, getting land acquired, getting final construction drawings made, getting needed laws, for a year's work totaling $40 per capita.

"If our plans are properly made, that work can be spread over five or more years in case no big emergency arises after the war. But if an emergency should arise—and we have every prudent reason for expecting one—is it not better to have the decks cleared for action, than to depend upon improvised projects that would consume billions of dollars without giving us the facilities we need on a sound engineering and fiscal basis?

"What guide posts do we have in doing this advance planning today? We know that our yearly national income must stay around the $140,000,000,000 mark to provide enough jobs to avoid an economic and social crisis. Past experience tells us that about $16,500,000,000 of this will be public and private construction. One-third, or $5,500,000,000, will probably be the amount available for public works. This totals $40 per capita.

"The first post-war needs will be for facilities and services to provide consumer goods to a people whose damned-up purchasing power will carry the inflation danger right over into the post-war period."

Mr. Kennedy stated that there are two divisions of public works: those that serve the public directly, like sewers and libraries, and those which also serve indirectly by providing an opportunity for private enterprise, like highways. This second class deserves high priority after the war.

"But," Mr. Kennedy concluded, "blueprints, specifications, proposals for bids —those are needed, prepared with broad vision as to their usefulness for the community and their value in speeding the day when private enterprise can carry out its determination to provide a job for every man able and willing to work, and a better way of life, that shall have been worth all this tragedy of war."

Texas and Mexico Plan Exchange of Engineers

The State of Texas has just passed a law which serves as a practical demonstration of the Good Neighbor spirit existing between the Lone Star State and its southern neighbor Mexico. The law authorizes the State Highway Commission to employ Mexican engineers or engineering students as may be designated by the Highway Department of Mexico on state highway projects for periods of six months, in exchange for like employment of Texas engineers or engineering students on Mexican highways.

The purpose of this exchange provides an opportunity to the Texas Highway Commission to aid the Federal Government in fostering and cementing closer and more harmonious relations with our neighbors to the south, and will likewise give both the Republic of Mexico and the Commission an opportunity of studying each other's procedures.

Wartime Maintenance With Asphalt and Tar

Massachusetts District 2 Tackles Problems Under Restricted Conditions on State and Town Roads

✦ IN the Commonwealth of Massachusetts, the highways on which the state has responsibilities for construction and maintenance are divided into three classes: state highways, Chapter 90 highways, and Chapter 81 highways, so designated because of the legislative acts controlling the participation of state funds, forces and equipment in their construction or maintenance. For the administration of the highways the state has seven districts.

District 2, with headquarters at Greenfield, is of interest from several standpoints. It includes Franklin County and parts of Hampshire and Hampden Counties, running from the Connecticut border to the Vermont-New Hampshire state line, and contains about one-fifth of the area of the entire state. Within this division are the three major war production centers of Springfield, Holyoke and Greenfield. Last, but by no means of minor importance, this Division is in an area of heavy snowfall.

Legislative Road Complications

Within District 2, there are 275 miles of state highways, 548 miles of Chapter 90 roads, and 1,633 miles of Chapter 81 roads. Originally, Chapter 90 roads were built by contract under state jurisdiction and financed usually by the state, county and town. Up to a few years ago, all maintenance of these roads was under the direction of and financed by the towns and counties, but at present the state makes an allotment to pay approximately one-third of the cost. This permits the state to designate the type of maintenance which the town does by force account under the direction of the State Department of Public Works.

Chapter 81 roads are in towns, usually designated as townships outside of New England, of less than $5,000,000 valuation. The state maintains the entire mileage of these roads and allots $150 a mile for this maintenance. The towns also appropriate additional sums varying from $15 to $150 per mile, depending on the valuation of the town and the miles of public road, exclusive of state highways, in that particular community.

Present Types of Maintenance

Maintenance on state highways consists of bituminous patching and surface treatment, cleaning ditches and slopes, mowing roadsides, building and maintaining guard rail, roadside planting and the care of all roadside trees and shrubs, maintenance of all drainage systems and the construction of any additional drainage, repairs to all bridges, the supervision of all permits issued to public service corporations as well as any work within state highway locations by private individuals, the erection and maintenance of all highway route marker signs and lights, and the removal of snow and ice from the state highways. The maintenance of Chapter 90 and Chapter 81 roads also includes scraping and cleaning ditches along the old earth type of road. On the gravel roads new metal is added, drainage structures are taken care of, and the roadsides are mowed. Either tar or asphalt treatment is given the road surface to establish a bituminous mat, either by the penetration method or by road-mix. Once the mat is established, it is maintained by patching and continued surface treatment. For 1943, the work done on these two types of roads has been curtailed below that done in the past years, due to the restrictions in the use of bituminous materials. On state roads, the maintenance has been reduced from 15 to 20 per cent in District 2 because of the shortage of labor and the restrictions on critical materials.

Surface-Treatment Methods

On state highways, District 2 used about 8,000 gallons of asphalt emulsion, AE-3, in 1942 for surface treatment, in addition to 35,000 gallons of AE-1 for patching, and some 20,000 gallons of tar for surface treatment. This is the first time that tar has been used in the District for several years for this purpose.

The surface treatment consists of applying ¼ gallon per square yard of the bituminous material and covering it with ½-inch stone at the rate of 18 to 20 pounds per square yard. In 1942 this program was only slightly less than that done in previous years, in spite of considerable loss of labor to war industries and to the Army, but was aided by the fact that tar was used in addition to asphaltic products.

Personnel

C. B. Raymond, Senior Civil Engineer, is Acting District Engineer of District 2, and C. S. Tinkham is District Maintenance Engineer, Massachusetts Department of Public Works, of which Raymond W. Coburn is Chief Engineer, and James E. Lawrence, Maintenance Engineer.

Some Hints on Maintenance And Safety for Jack Users

"Maintenance and Safety Hints" is the title of a new booklet for users of mechanical lifting jacks to help them use jacks properly. Prepared by "the House That Jacks Built", the Duff-Norton Mfg. Co., Box 1889, Pittsburgh, Penna., this booklet points out that it is important to the war effort not only to conserve irreplaceable equipment and use it wisely, but also to use it safely in order to avoid accidents and lost time due to injuries. This latter point is particularly vital in these days when many people are making old equipment "do".

Your jacks and jack handles should be checked regularly to be sure both are in good condition. Avoid overloading your jacks, but if a jack has been overloaded or strained, don't use it again until it has been thoroughly inspected and repaired if damaged.

Other information contained in this booklet indicates the proper way to use lifting jacks, how to care for them to increase their service life, many uses to which they can be put, and the features of Duff-Norton jacks of the ratchet and screw types.

Copies of this booklet may be secured without obligation by contractors and state and county highway engineers direct from the manufacturer. Just mention this item.

Lubrication and the War

In a new booklet entitled "90 Years of Industrial Pioneering" issued by the Swan-Finch Oil Co., RCA Building, West, New York City, and 201 No. Wells St., Chicago, Ill., the progress in the development of lubricating oils is interestingly presented and the contribution made by lubricants to the war effort is described. The booklet is illustrated with reproductions of a number of old industrial prints.

Copies of this booklet may be secured by those interested by writing direct to the company on their firm letterhead and mentioning this magazine.

New Welding Bulletin

A new bulletin entitled "Recommended Practices for the Spot and Seam Welding of Low Carbon Steel" has just been approved and published by the American Welding Society. The data contained in this bulletin has been compiled by canvassing approximately sixty fabricators of mild steel structures and resistance-welding equipment manufacturers, and represents the best information available on the subject at this time.

The bulletin is composed essentially of two charts, one each for spot and seam welding, together with an explanation of their use. Copies of the bulletin may be obtained from the American Welding Society, 33 West 39th St., New York City, in the form of a 4-page 6 x 9-inch leaflet. Price: 10 cents.

For Drafting Rooms And Engineer Offices

A new handy chart which gives at a glance the equivalent of fractions in four-point decimals has just been published for free distribution by the United States Rubber Co., Mechanical Goods Division, 1230 Sixth Avenue, New York 20, N. Y. Copies of this chart will be sent free to state and county engineers and contractors writing on their business letterheads and mentioning this item.

Federal Bills Proposed To Finance City Work

(*Continued from page 2*)

Fortunately, this condition does not apply in all cities. Many businesslike municipal administrations have operated upon a "pay-as-you-go" basis or have a well-planned orderly financing program ready for the sale of municipal bonds for post-war work. A number of cities report that they have as yet established no reserve fund for post-war construction because they are using every available penny today to reduce the municipal debt and thus improve their credit status against the day when they will want to borrow to finance post-war construction.

Plans for Federal Financing

Companion bills H. R. 2783 and S. 1137 were introduced in the House and Senate at the request of the President after he had called attention to the need for advance planning of public works projects to be undertaken after the war. Title I of the act, "Federal-Aid Planning Act of 1943," authorizes the annual appropriation of not less than $10,000,000 to assist states and political subdivisions in establishing and supporting agencies to prepare comprehensive plans and maintain programs for development into specific work projects. Fifty per cent of this amount would be apportioned among the states in the proportion that the area of each state bears to the total area of all the states and 50 per cent in the proportion that the population of each state bears to the total population of all states. As a prerequisite each state would have to establish by law a State Planning Agency and enact such legislation as may be necessary to enable the political subdivisions to establish planning agencies to prepare comprehensive plans and programs for their respective jurisdictions.

Title II authorizes the appropriation of $75,000,000 for advances through existing Federal-Aid agencies to any state or political subdivisions "for the making of such examinations, surveys, investigations, and architectural and engineering plans and specifications for specific public works and improvement projects as may be necessary to facilitate and expedite the selection and inauguration of such projects and improvements in the post-war period". Amounts advanced to state and local agencies under these bills would be repayable if funds later become available through appropriation by, or grant, gift, or loan to, such agencies for the undertaking of public works or improvement plans. It will be noted that although these bills are for the financing of planning, they hint very strongly at future possible Federal money for municipal work.

Another bill was introduced by Senator Robert F. Wagner, of New York, calling for an appropriation of $1,000,000,000 for loans to cities to purchase land for post-war development. This bill was introduced at the request of the Urban Land Institute as a stimulus for a 10-year program, which would probably result in the expenditure of at least $50,000,000,000 to rebuild blighted areas in cities. It is believed that the provisions of this bill would bring out $5 in private expenditures for every $1 of Federal money expended. The bill requires cities to make comprehensive plans for the redevelopment of slum districts. Federal funds, on long credit, are extended to cities for the purchase of large areas of land to permit the removal of obsolete structures. Cities would be permitted to sell or lease the whole or parts of these areas to private developers for the construction of new neighborhoods under a general city plan for the area. The repayment of Federal funds would be made from the proceeds of sales and rental of the land to private interests. It will be seen from this that the Wagner Bill is essentially an act to stimulate private enterprise rather than to promote public works.

Senator Thomas of Utah has introduced a bill in Congress to establish an Urban Redevelopment Agency with a $250,000,000 fund to be lent to municipalities for the purchase of blighted areas for public parks as well as for renting by the city to private individuals or corporations for commercial, industrial, and residential use. It is believed that such a plan would stimulate a very large building program because of the deflation of values in these blighted areas and their rental at a reasonable rate for private use.

How Cities Plan Financing

The International City Managers Association made a poll of 92 cities to determine their plans for post-war work and for financing both the design and ultimate construction of these projects. Only 3 of the 11 larger cities in the 92 polled anticipated outside help in their post-war plans.

In a survey made by THE AMERI-

(*Concluded on next page*)

City Saves Money By Paying Own Bill

(*Continued from preceding page*)

CAN CITY Magazine between November, 1942, and June, 1943, covering 258 cities over 15,000 population, with particular reference to the creation of reserves in cash or war bonds for post-war construction, 27 per cent reported establishing some reserve; 64 per cent are creating no reserve, but some expect to float bonds when required, will make direct assessments for improvements, or hope for state or Federal financing; 3 per cent are considering creating a reserve; and 6 per cent report there is no legal provision for such a reserve in their charters or under existing state law.

How the Voters Feel

The Civic Research Institute of Kansas City, Mo., in a recent public-opinion survey, brought to light considerable concern over post-war problems among the 1,000 citizens interviewed. One fourth think that times will be pretty good for 10 years after the war, and almost one half anticipate a serious depression if the Government has no public relief program.

Seven out of ten think a post-war public works program will be needed in Kansas City after the war, while most think of it in terms of providing needed work rather than to meet the need for improvement to existing facilities. A majority think that public-work plans should be worked out now, not later.

The weight of opinion is toward giving the city rather than the Federal Government responsibility for working out plans, but when it comes to the question of who should put up the money for the work, opinion shifts toward giving city and Federal Government equal responsibility in financing. A majority of the citizens interviewed would like to see the city put money aside now for post-war public-works construction, but the survey seems to show that any general public concern over post-war problems has not yet been crystallized. When people were asked whether present city services should be cut in order to build up a reserve fund for post-war public works, about two thirds were reluctant to give up any existing services.

Local Financing Costs Less

The offer of "40 per cent grant and 60 per cent loan" or some other form of Federal financing for municipal construction is a difficult bait to push aside. Many officials feel that they will be criticised by the taxpayers and local press if they do not take advantage of any and all gifts offered by the Federal Government. Many engineers with whom we have talked have spoken bitterly of the excessive costs of projects, even under well-administered PWA, resulting from numerous Federal restrictions and red tape.

As an example we present the true story of two cities of approximately the same size, each of whom, during the '30's, decided to build a municipal power plant. The needs, and in fact the general design, of the two plants were very similar so that one would expect the costs to be similar. The first city, using its own funds, employed a consulting engineer, who drew up the plans and specifications, and the city awarded a contract to a private contractor for the construction of the plant. The entire job was completed at a cost of $90,000. The second city also employed a consulting engineer but sought Federal financing through PWA, with the result that, even though the economical method of awarding the contract to the lowest bidder was used, the total cost eventually reached $160,000 because of restrictions, red tape, and delays imposed as a corollary of Federal aid.

The city which would get the most for its money will do its best to finance its post-war design and construction program with its own funds, either from reserves set aside now in the form of cash or war bonds or through a "pay-as-you-go" plan or through bond issues. The most economical form of construction is the award of contracts to the lowest responsible bidder, based on the designs and specifications of a reputable consulting engineer, all financed from the city treasury.

If you are tempted to use gasoline unnecessarily, just remember that in fifteen days of fighting in the skies above Tunisia, Major General Doolittle and his 12th Air Force Command burned up 16,500,000 gallons of aviation gasoline. This is 1,550,000 gallons more than the 14,950,000-gallon monthly ration of regular gas for the Atlantic Seaboard section of the country.

Some Safety Rules

The skill and strength of our workers in every branch of industry must be guarded against accidents and diseases to carry through the war production program and insure ultimate victory. Job accidents in the United States from July, 1940, to January, 1943, the 30 months covering the defense program and the first year of war, brought death to 48,500 workers; cost 258,000 an eye, finger, hand, arm or leg; and laid up 5,300,000 for an average of three weeks each. Days of work lost in these accidents totaled 110,000,000, or more than 375,000 man-years.

In the first eighteen months of the war, our announced battle casualties have numbered 12,123 dead, 15,049 wounded, 40,435 missing, and 10,628 prisoners of war, a total of 78,235, according to the OWI.

Most job accidents can be prevented, and with this end in view the Secretary of Labor's committee to conserve manpower compiled a list of do's and don'ts to keep workers from getting hurt. Among the suggestions for construction workers are:

1. Look out for those below you. Make sure that no one is in the way before you lower or throw anything, and don't leave materials or tools where they will fall.

2. Test a scaffold plank with four times the load it may have to bear in actual use. Discard the plank if it shows the slightest weakness, and mark it so that no one else will use it for that purpose.

3. Keep out from under suspended loads.

4. Report immediately defective tools, ladders, scaffolding, or equipment.

5. Make sure of your footing; more construction workers are killed each year by falls than in any other way.

6. Use life belt, goggles, hard hats, safety shoes, or anything else which will make the job safer for you.

7. Make sure your fellow worker understands what you are going to do. Misunderstandings may get you or somebody else into an accident.

To these we add this: watch your Safety Bulletin Board regularly, read the safety posters and instructions thereon, and apply them in your own work.

Theoretical Soil Mechanics

A 510-page volume "Theoretical Soil Mechanics", written by Karl Terzaghi, one of the leading engineers in the field of soil mechanics, has recently been published. The jacket statement well covers the scope of this valuable discussion of one of the divisions of the field of applied mechanics, "This volume discusses thoroughly those theories which have stood the test of experience and which are applicable under certain conditions and restrictions to the approximate solution of practical problems".

The nineteen chapters cover the entire scope of soil mechanics studies as completely as any printed text available, excepting only the *Proceedings* of the First International Conference on Soil Mechanics (Cambridge 1936).

Copies of "Theoretical Soil Mechanics" may be purchased direct from the publisher, John Wiley & Sons, Inc., 440 Fourth Ave., New York City, or from this magazine. Price: $5.00.

The "Big Push" Needs Scrap; Keep It Coming for Victory

Based upon plans for the Allied offensive against Europe, the steel mills of this country will need at least 1,000,000 extra tons of heavy melting scrap during the last six months of 1943. In addition to this, the uncertainty of the outcome of the coal strikes, and the loss of coal production which has already resulted from strikes, have put a severe strain on our steel production, just at a time when the WPB was asking for even greater production of steel to meet the demands of the "Big Push".

Because of present uncertainties in the coal situation, industry's scrap salvage activities must be stepped up so that by the use of scrap during a fuel shortage, the steel mill blast-furnace operation may be by-passed if necessary, thereby saving about 75 per cent of coal consumption. This is because scrap is not used in the blast furnace, but is fed into the open hearth with pig iron. In order to by-pass the blast furnace, the mills must draw upon existing stocks of "pig" and raise the percentage of scrap in the mixture so that the supply of "pig" will not be completely exhausted.

We have urged our readers many times before to make another search for scrap, and be sure that anything which is not usable is turned in at once. But we have now reached a critical period in the war, the invasion of Europe is on, and our men on the fighting front need all the backing and equipment we can give them. So make one more search through your shops and yards. Scrap faster and win sooner!

Sizes of Paving Brick Are Reaffirmed Again

Simplified Practice Recommendation R1-40, Vitrified Paving Brick, which was reaffirmed without change in 1941 and 1942, has again been reaffirmed by the Permanent Committee of the industry, according to an announcement by the Division of Simplified Practice, National Bureau of Standards.

This recommendation, which was first proposed and developed by the industry in 1921, has since that time been reviewed annually, and revised ten times. In its recent survey, the committee found that 77.1 per cent of the total shipments during the calendar year 1942 were in accordance with the five sizes shown in the Simplified Practice Recommendation.

Copies of this recommendation may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price: 5 cents.

Oil-Mat Seal Used In Road Maintenance

(*Continued from page* 15)

spots and a bad riding surface. The only thing to do is to pick up the mat, and see that the base is dried out before the mat is laid down again. Or, if the mat is wet, then it must be thoroughly dried out and some asphalt added and the whole reworked on the road. Under these conditions, the money expended for a seal on the mat would be entirely lost as it would be incorporated into the mat during the picking-up operation.

Prior to placing a seal, the surface of the oil mat is thoroughly cleaned with rotary brooms and then the surface is given a tack coat of ¼ gallon of RC-3 or RC-4 per square yard for one-half the width of the road so as not to disturb traffic. The chip seal is composed of ¾-inch crushed gravel with not more than 10 per cent passing a 10-mesh sieve nor more than 2 per cent passing a 200-mesh sieve. These are applied at the rate of 10 pounds for each 0.1 gallon of asphalt in the tack coat.

A novel method of applying the chips is used. The Buckeye spreader boxes are mounted on the front of the power graders. To load, the grader backs away from the tacked section, the truck dumps its load to fill the hopper and drives away. The grader then goes forward to the strip and begins to spread ahead of its own wheels. When the box is empty, the grader backs up so that the truck can get in ahead of it without touching the tack and the box is refilled. The chips are rolled at once by 8-ton tandem steel-wheel rollers. The rate of application of the chips from the box is controlled by the mechanism of the spreader box. The raising and lowering of the spreader box is controlled from the cab by the scarifier attachment.

A rotary broom or Kinney steel brooms are used on a grader in place of the blade to kick back chips that have been swept off by traffic. This is done only in hot weather and when there is some bleeding of the surface.

These seals are good for from two to three years. When the roads are re-sealed, ⅝-inch chips are used in the same manner as the original operation was carried out.

Personnel

The Maintenance Department of the Colorado State Highway Department is in charge of Douglas N. Stewart, Superintendent of Maintenance, under the direction of Charles D. Vail, State Highway Engineer.

War Transportation Speeded by Dynamite

The construction of new rights-of-way and the elimination of old tunnels on one railroad alone in western Pennsylvania and eastern Ohio has done much to speed war transportation between the East and West. Present-day transportation demands are making some of the old railroad tunnels obsolete, as the larger modern engines and cars cannot pass through these tunnels, which often have only one or two tracks. These bottlenecks are now being removed by the use of dynamite.

Near Burgettstown, in Washington County, Pennsylvania, 27 miles southwest of Pittsburgh, the Pennsylvania Railroad is eliminating one of its old tunnels by building an open cut about 4,500 feet long. Some 500,000 pounds of dynamite will be used on this job. When completed, the cut will be 74 feet wide at the base and 120 feet deep at one point. Groves, Lundin & Cox, of Minneapolis, Minn., the contractor for the work, will remove 125,000 cubic yards of dirt and 900,000 cubic yards of rock.

Another tunnel, on the same railroad, will be eliminated by a new by-pass near Cadiz, Ohio, about 25 miles northwest of Wheeling, W. Va. About 350,000 pounds of dynamite will be needed to make the new right-of-way, about 4,500 feet long. It will be 60 feet wide at the base and 75 feet deep. This new construction will necessitate the blasting and removal of 500,000 cubic yards of rock and the excavation and removal of 200,000 cubic yards of dirt by Mauger Construction Co. of Columbus, Ohio, contractor for this work.

The construction of the cut-offs will require the most efficient use of explosives, with the work being pushed as rapidly as possible without interfering with daily train movements.

Your idle equipment is working for the enemy. If you haven't any use for it, put it into the hands of those who have.

A new lubricator for air lines to provide automatic lubrication of air tools.

Air-Line Lubricator For Oiling Air Tools

The Air-Lube Lubricator, made by Filters, Inc., 1515 Gardena Ave., Glendale, Calif., provides automatic feeding of a regulated oil mist into air tools to eliminate the need for frequent daily oiling, prevent "freezing" and to aid in the conservation of present valuable air-driven equipment. This light-weight lubricator is recommended for use in an air line from 1 to 6 feet from the tool, or may be used in the air pipes for larger air-driven semi-portable or stationary equipment. Installing the lubricator in the hose near the tool eliminates the deterioration of rubber hose lines.

A positive feeding action provides a regulated amount of oil, but feeds oil only when the tool is operating. The oil reservoir holds enough oil for more than a week of normal usage, and a clear Lucite window shows when the lubricator needs refilling.

Positive regulated wicking action with an automatic shut-off prevents any flooding of air tools with oil. Unless otherwise specified, two standard settings are provided from the factory, and operators thus cannot tamper with the oil feed settings.

Further information on these Air-Lube Lubricators, as well as on the company's filters for air lines, may be secured by those interested direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

New Highways Aid Central America

For the first time, highway communications are being opened this year across four national frontiers in Central America as a result of the wartime acceleration of construction of the Inter-American Highway. Construction of pioneer roads to close the remaining gaps in the Highway has been pushed during the current dry season, according to E. W. James, Chief of the Inter-American Regional Office, Public Roads Administration.

Up to now only two pairs of countries in Central America have had reasonably good communication across their common frontiers. Mexico and Guatemala have long been connected with fair frontier communications, and El Salvador and Guatemala have had a similar connection. Now, with the rapid closing of the remaining gaps, highway communications are opening across the frontiers between El Salvador and Honduras, between Honduras and Nicaragua, and between Nicaragua and Costa Rica. Construction has also been pushed across the frontier between Costa Rica and Panama.

Mr. James said that improvement of highway communication in Central America should serve opportunely to aid in the development of the economic resources of these countries, including fibres, rubber, minerals, and other strategic materials for war use.

In addition, these new roads open the way for increased commercial traffic, and for the exchange and distribution of products which heretofore have moved in large part by sea, or not at all. Therefore, these roads should greatly stimulate the trade between these countries, in addition to improving overland communications for wartime needs.

Wartime closing of the remaining gaps in the Inter-American Highway in Central America is being rushed with funds and engineering assistance provided by the United States. In addition, the Export-Import Bank of Washington has extended credits for $30,000,000 to Mexico for acceleration of highway construction. Mexico's new roads include a 275-mile link south of Mexico City, between Cuautla and Oaxaca.

By July 1, according to Mr. James, the only big gaps remaining in the Inter-American Highway from the Rio Grande south to the Panama Canal were in southern Mexico and in Costa Rica. These breaks are in rugged mountain country which presents some formidable engineering problems, even compared with the obstacles encountered in outstanding feats of road building in the mountainous sections of the United States. In some places elevation rises to about 11,000 feet along the line mapped out for the Pan American Highway system. Engineers are working to close the gap in Costa Rica in 1944. Mexico may take longer to close her gaps but, in the meantime, her rail connections will be available for overland traffic moving through Central America.

"Ounce of Prevention" For Alcan Equipment

(*Continued from page 23*)

tool is needed and isn't there, the mechanics go to the forge and make the tools they need from whatever is at hand.

Preventive Maintenance

Special emphasis has been laid on preventive maintenance. Truck drivers, shovel runners and cat skinners have been carefully trained in the operation and maintenance of their particular type of equipment and cautioned to follow strictly the manufacturers' recommendations. Many of the manufacturers have their own representatives right on the highway to give detailed instructions in the operation of equipment.

Under the heading of preventive maintenance has been the regular inspection and servicing of all machines on the job, including the wire rope on the bulldozers, scrapers and shovels, most of which are equipped with preformed wire rope which outlasts wire rope of ordinary construction. Periodic inspection for signs of abrasives, regular cleaning of the cable, and frequent lubrication have effectively lengthened the life span of the rope under the strain of continuous operations.

In addition to the main repair shop, Okes has two mobile repair shops, well equipped with everything from welding outfits to lathes, which effect many major repairs right in the field. In addition to these repair units, most of the subcontractors operate their own traveling as well as stationary repair shops.

During the past winter, the mechanics were busier than ever, overhauling and reconditioning all equipment for a resumption of operations in the spring. Cold weather meant only an intensification of their labors. Much credit is given to the various groups involved in the construction of the Alaska Military Highway, but well up on the list should be the grease monkey and the grimy mechanic, without whom there would be no Highway.

Waterproofed Gravel For Alaska Airports

Morrison Knudsen Co. of Boise, Idaho, and R. J. Sommers Construction Co. of Juneau, Alaska, are planning to use substantial quantities of Kotal for the waterproofing of gravel in the construction of a number of airport runways to be surfaced this summer in Alaska under contract for the Civil Aeronautics Administration. The conditions of use will vary at the different sites. In one, undried gravel will be waterproofed with Kotal and mixed with an RC cut-back asphalt in Pioneer plants. On another job using undried gravel, an MC cut-back will be mixed with it by blading. A seal coat will be applied at other sites, using undried chips that have been Kotal-waterproofed and spread on RC cut-back asphalt.

One of the most interesting applications will be in connection with a sand-emulsion mix. Great difficulty has been experienced under the very wet conditions prevailing at this site in securing a proper break of the emulsion and subsequent set in the pavement. The sand contains between 10 and 20 per cent of water most of the time, and the emulsion mix laid last year had not set up properly by this spring. The Kotal treatment will be applied by Wood Road-Mixers after the application of the emulsion, as it has been found possible by this means to control the time of the break of the emulsion. This insures a good set at the time most convenient to the contractor and quite independent of wet weather conditions.

Kotal Co., 52 Vanderbilt Ave., New York City, reports that five carloads of Kotal have already been shipped to Alaska and that further shipments are in preparation. Further information regarding this waterproofing material for aggregates used in bituminous work may be secured direct from the company.

Old County Bridge Rebuilt With Scrap

Ingenuity, Old Steel and Welding Transform Bolted Bridge Into a Stronger, Wider Structure

By HOWARD R. CRAIG, County Engineer, Auglaize County, Ohio

♦ BRIDGE building and repair without the facilities of the steel mill is the problem bridge engineers are facing today. In the course of construction of several reinforced-concrete bridges in Auglaize County, Ohio, a fair-sized stockpile of odd lengths of I-beams, angles, and channels had accumulated. While the size and length wanted for odd jobs are seldom found, arc welding has made possible the rebuilding and widening of several bridges through the use of odd lengths and shapes from this stockpile.

Old Bridge a Bottleneck

In 1941, the narrow road leading to a bridge known as No. 112 Union in Auglaize County was widened to 20 feet. Since the bridge was only 14 feet 6 inches in width, a serious bottleneck was created. Further the bridge had a capacity of but 5 tons so that, with the improvement in the road, the bridge did not meet the requirements of the heavier traffic using the highway.

All of the connections for the old bridge were bolted and the webs of the I-beams were set between two short angles bolted to the end channels. The channels used for the beam seats were set with the flanges down to provide room for bolting the bottom flange of the beams to the webs of the channels. This threw the entire dead and live load on the flanges of the two small channels. The side rails were latticed with two angles back to back which were merely bolted to the end and side channels. This type of construction could not withstand the impact of the increased and heavier traffic.

By salvaging the seven I-beams in the old structure, only eight more beams were needed to widen the structure the necessary amount. In our stockpile there were plenty of I-beams but not of the required lengths. Our portable arc welder proved to be the solution to this problem as by careful selection of the odd lengths of beams in the stockpile, we were able to cut, splice, and assemble the eight additional beams with only 1 foot of waste.

The channels used for the beam seats were lengthened by welding on additional channels. Instead of placing the channels with the flanges down, they were reversed with the flanges turned up, thus giving the necessary additional bearing. The front flange was cut out at the beam spacings. In this way we were able to salvage the steel from the old bridge.

Bolts anchored in the old abutment run through the seat channel and through slotted holes in the plate to provide for expansion. The latticed side rails were eliminated and replaced with a commercial-type beam guard rail as a further factor of safety. This could be done easily by welding, and bracing one post at the middle of the span.

The complete steel superstructure of the widened bridge was welded into one solid unit. On this was laid a treated strip floor of 2 x 4 lumber, using a standard commercial I-beam clip. This redesign brought the bridge from a 5-ton loading up to an 8-ton capacity. The abutments of the bridge were lengthened prior to the work on the steel superstructure. In case any damage should occur to the widened abutments in the future, the solution would be simple. Since the superstructure has been welded into a solid unit it would only be necessary to jack up the entire superstructure, slide it to one side, build entirely new abutments, and slide the bridge back into place with no loss of strength or material.

Economy and Costs

The rehabilitation of this bridge was planned, designed and figured in 1941. The actual construction started May 13, 1942, and was completed May 27, 1942. The total labor bill for the entire repair job was $220.00 and the material cost was $209.46, including the new treated floor which is not in the "critical-material" category.

Future Program

The prospects for more of this type of work are practically unlimited in Auglaize County as we have already set up a five or six-year program. There are approximately 450 bridges of this type and size in this small county. The bridge described was of 20-foot span. However, the same method of operation is just as practical on bridges of more than 20-foot span. By the use of welding it is possible to utilize all of the existing material, whereas by the old method of riveting and bolting there was always much loss of strength in the structure, and waste of labor and material. Further, by the use of welding, all connections are more simple, and more easily made, effecting a considerable saving in labor. This type of construction will require post-war steel mill production for the structural shapes needed to complete the jobs on other bridges included in our rehabilitation program.

This article is a portion of a paper in Classification L-2, Maintenance of Structures and Structural Applications, which received an Honorable Mention Award in The James F. Lincoln Arc Welding Foundation Award Program.

Demand for New Homes Seen in Post-War Era

(*Continued from page 2*)

Foreign and Domestic Commerce, U. S. Department of Commerce, contains this helpful analysis. "Residential construction in 1919 was already above the pre-war level, even when measured in terms of dwelling units rather than dollars. After a brief recession the upward trend was resumed. By 1925 the volume was double the best pre-war year, and there was no substantial curtailment of the housing boom until 10 years after the war. The foundations for this boom seem to lie partly in the low level of construction during the war and partly in the high level of post-war national income which enabled people to spend more for housing. There was evidence of a housing shortage at the end of the war similar to that which is now developing. Population growth was a relatively more important influence than it is likely to be after this war, but the possibilities for replacement of existing structures were less favorable."

The Livingston report continues, "With the maintenance of a high level of production after the present war and the corresponding increase over pre-war consumers' incomes, there would be a more than proportionate increase in the demand for consumers' durable goods. This would result partly from the desire to reach a higher standard of living in terms of such things as more automobiles on the road and more electrical appliances in the homes.

"Housing provides a particularly striking example of the leverage exerted by an increase in consumer purchasing power. It is significant because the relatively low volume of construction was the chief reason for the failure to achieve full recovery in the '30's.

"In 1940 the average non-farm household lived in a dwelling with a rental value of only $27 per month as against $43 10 years earlier. They could not afford anything better because the average income per household had declined in about the same proportion.

"The net increase in non-farm families was greater in the 5 years, 1936 to 1940, than in any 5 years during the height of the construction boom in the '20's. But most of this increase was concentrated in the low-income groups which could not afford new construction. The number of new dwellings constructed during the decade was considerably less than the increase in households, and many of the new dwellings were of the cheapest sort. There was practically no replacement demand.

"Given a continuation of the present average family income, which is commensurate with the effective utilization of available man-power after the war, the conditions of the past decade would be reversed. Several million families would move up into an income class where they could afford new construction. Several million of the most unsatisfactory dwellings would have no market and would have to be replaced. On the other hand, the demand for additional housing in those price classes where new construction can compete with existing structures would be considerably larger than the increase in population since 1940.

"Since the cost of a dwelling is roughly ten times the annual rent or the equivalent current cost of ownership, and since typically a large part of this cost is borrowed, the necessary expenditures on new construction to meet this demand would be much larger than the increase in expenditures on housing out of current income. Thus in this important field the increase in the demand for goods would be considerably greater than the increase in consumer purchasing power. The same sort of leverage exists to a lesser extent in durable goods with a shorter life."

According to Charles A. Mullenix, of Cleveland, Ohio, President, Mortgage Bankers Association of America, the biggest error in current thinking and discussion about post-war housing—too much thinking and too little common sense—should be corrected now before the nation gets off to a false start in what will undoubtedly be one of the greatest sources of employment in the post-war era. Mr. Mullenix states, "There is too much theorizing by reformers and planners and uplift elements and far too little consideration of what the people themselves want in post-war housing, urban rehabilitation and slum clearance. For example, the best available information indicates that more than 65 per cent of urban residents now would like to continue living in their same neighborhoods, while another 25 per cent want to move 'out farther'. These facts, subject to a more complete check in the post-war era, will have to be weighed when we consider great shifts of population caused by vast housing projects."

Old concepts of city planning must be discarded after the war. Americans will not be able to afford to have their ways of living and working hampered by city patterns that have outlived their usefulness. In the past decades cities have grown from the edge outward and rotted at the center. The nation is beginning to realize that large-scale design and large-scale rebuilding must be employed to bring the depreciated and decaying central areas of our cities up to a modern state of efficiency.

The Committee on Post-War Reconstruction of the American Institute of Architects points out that it is apparent that any comprehensive scheme for replanning and redevelopment must recognize the necessity for changing the planning point of view from the basis of the individual property to the basis of the locality and to planning for groups of properties and groups of buildings instead of for the individual building and the individual plot. The report continues, "Unregulated urban growth has created economic and financial problems which demand attention. A cause which has contributed to the chaotic growth has been the fact that the development of real estate has proceeded almost entirely on the basis of the development of single plots of property for individual ownership. Only in rare cases has effective planning been done on a group or locality basis." This calls for greater direction by city planning commissions and through zoning to protect such developments.

A major repercussion in the price of houses, building sites, and farms will follow the construction of new highways and parkways planned as post-war employment measures. State Senator Thomas E. Desmond, of Newburgh, N.Y., states that in his opinion such construction would alter realty values by shifting the flow of automobile traffic and by opening up new areas for residential housing and business development. Con-

(*Concluded on next page*)

Variety of Building Projects in Prospect

(*Continued from preceding page*)

curring with this, Bror Dahlberg, President, The Celotex Corp., in speaking before the American Society of Planning Officials, said that super-highways, broad turnpikes, improved buses, railway equipment, and subways are important, but these no longer limit our horizon. Homes can be placed in terms of flying time in the future. A hundred miles may be comfortably near. We must visualize the full implications of aerial bus service for mass travel and of cheap private planes for the common man. Then there is the helicopter, that new flying machine that can go straight up or straight down, that can fly sideways and backwards, and can hover stationary in the air or speed up to hundreds of miles per hour.

Mr. Dahlberg stated, "The sharp reduction in the cost of shelter, combined with faster travel, may make the crowded apartment building undesirable as a housing unit, may spread out cities fanwise over large areas, may result in the decline of city living quarters in favor of rural islands of integrated manufacturing and housing units."

Large Housing Project

In the field of larger developments, the outstanding project is that of the Metropolitan Life Insurance Co. for a $50,000,000 low-cost housing development on the lower East Side of New York City, which will take in from ten to twelve city blocks. In the project only 30 per cent of the tract will be covered by buildings, the remainder being devoted to roadways, lawns, landscaping, and other facilities. The project is planned to house a total of 30,000 people in apartments which will rent for $12 to $14 a room. It is interesting to note that the population in the area in which this development is to be located has dropped from 27,000 in 1920 to only a little more than 10,000 at the present time.

Urban Redevelopment

The redevelopment of blighted urban areas, talked about a great deal during the past decade, is more than likely to grow into really large-scale programs throughout the country. A number of people are advocating that this should be done on a national scale, with subsidies for local communities by the Federal Government. Others, equally impressed by the necessity of doing this job on a large scale, believe that it can be done and done more soundly through local initiative and private investment; to this end, several states have enacted enabling legislation to encourage private initiative and private investment.

Local planning officials must be certain that new construction in blighted areas, whether by private capital alone or subsidized by municipal, state, or Federal funds, provides housing facilities for the former slum dweller at a price he can afford to pay. He should not require constant welfare funds to permit him to live in a slum-clearance project which has so changed the rent base that those of a higher economic stratum move in, taking advantage of lower rentals which are still too high for the unsubsidized former slum dweller.

Industrial Construction

There has been a feeling that the tremendous volume of industrial construction for war plants will of necessity supply the industrial building demand for a great many years to come. It is heartening to find a recent report of F. W. Dodge Corp. stating, "Despite the tremendous war-plant construction program of the past 3 years and despite the anticipated surplus-plant problem of the post-war era, a larger volume of industrial-plant construction is anticipated during the 10 years following the war than in the 1930-1939 decade. The estimated increase of the post-war decade over the pre-war decade is about 30 per cent, in terms of 1940 dollars.

"Expectation of post-war demand is based upon the currently accumulating deferred demand for new plant capacity in unexpanded civilian-goods industries: food products, paper and pulp, printing and publishing, stone, glass and clay products, textiles, refrigerators and cold storage, lumber and woodworking, leather and leather-working, railroad shops, etc. In spite of greatly increased demands for their products, this group of non-war industries has shown a declining volume of new-plant construction since October, 1941, when first restrictions were placed upon non-essential civilian construction of all kinds; the decline from 1941 to 1942 was 31 per cent. In peacetime, through prosperity and depressions, this non-war-industry group invests 50 per cent more annually in new plant facilities than does the war industry group."

Financing

Federal, state, municipal, and private funds will be required to finance the needed deferred home-building program after the war. New York State has taken the lead in passing a $150,000,000 appropriation for low-rent housing. It permits immediate purchase of land, drawing of plans and specifications, and making contracts ready to be awarded so that work can be started 30 days after the last gun in this war is fired. In the discussion of this bill, it was pointed out that unless New York State planned immediately for post-war housing, New York City as well as upstate communities would face an acute housing shortage by the end of the war.

Again we make the point that the vast construction of housing projects requires financing by private initiative, with the work done by contract, as the means of creating needed housing, needed employment, and a continuation of private industry without Federal domination.

Watchfulness Repaid In Power Shovel Care

(*Continued from page* 17)

ness, because only study and experience can teach you to recognize the little things which are the forerunners of greater mishaps.

Make sure that all chains are maintained at the proper tautness, and see that they are well greased at all times. This is especially true of the crawler drive chains and the chain-driven boom hoist. The tightness of the crawler belt should also be watched closely. Repairs on clutches and brakes should be made carefully and always with the proper tools. When assemblies are taken apart, adjacent and related assemblies should be checked for wear at the same time, since they are then usually much more accessible.

It is vital that all keys, pins, seals, and other small items be restored in the same way and to the exact position from which they were taken. Careless reassembly after a repair or a replacement has been made can often do more damage than the original disorder. When disassembling a unit, all parts should be plainly marked, not only to facilitate reassembly but also to prevent injury from faulty positioning. Having a piece of mechanic's chalk handy may save hours of guess work. Mark each piece and each position and you won't have to resort to the "trial and error" method.

Watch for Wear

Bear in mind that the job a shovel does is a strenuous one, and no matter how strong the materials used in building it or the care and accuracy in connecting and adjusting the various sections, stress and wear will eventually take their toll.

This is especially true in the case of buckets and dipper teeth. To maintain your front-end equipment at a high working standard, watch the cutting edges. A shovel, trench hoe, clamshell, or dragline cannot dig effectively with dull worn teeth. Worn teeth can be removed and replaced by the extremely simple operation of knocking out a pin. If new teeth are not available, the old ones can be built up by welding or, if badly worn, by tacking on a piece of repointer bar and then welding. (See C. & E. M., April, 1943, page 35, for detailed article on the care of buckets.)

Check the sheaves and cable for the shovel boom frequently. Make sure that the saddle block does not wear loose, and watch the bushings of the shipper shaft. Proper adjustment at all times will prolong the life of the crowd chain which drives the dipper stick.

When the chain on your dragline shows signs of wear, it should be reversed, as the greater wear comes on the bucket end. Mud, sand or other materials being handled should be kept out of the sheaves, fairlead and other places where they act as abrasives. It is also well to remember that a dragline bucket is a digging tool, and not to be used for cracking concrete slabs or pulling up stumps. It should be *lowered* to a proper digging position instead of being dropped on its nose or arches, an action extremely hard on front hitch plates, arches and the entire shovel, and one for which there is no excuse save carelessness.

Bear in mind that when a clamshell has been used under water, the felt seals of the bucket should be changed every six months or oftener, instead of once a year.

Ten Commandments for Engines

Naturally smooth trouble-free operation of the excavator's power plant is essential, and here again the need for continual watchfulness must be emphasized. Your shovel's engine, unlike that of your automobile or even your trucks, is subjected to constant rack and stress which frequently throw accessories out of adjustment and lead to serious trouble.

Here are "Ten Commandments" of engine operation which will help you avoid engine trouble:

1. Know your engine thoroughly. Read the manual of instructon furnished by the manufacturer and do the things advised in it.
2. Keep the engine and its accessories clean. Dirt often hides trouble in the making. Look for loose connections or bolts as you clean.
3. Keep the radiator filled with clean water. Never add water to an overheated engine.
4. Use only the oil of recommended specifications and made by a reputable company.
5. In starting, use the choke no more than necessary, as too much use of the choke allows gasoline to dilute the oil.
6. Warm up the engine slowly when the weather is cold. Never race a cold engine.
7. Do not force the engine; avoid overload. When not using the engine, idle it. Stop it if the period is prolonged, unless the weather is sub-zero; then allow the engine to idle.
8. If trouble develops, correct it before it becomes serious. Don't run an engine that is not operating properly.
9. Always keep the air and oil filtering system clean.
10. Personally inspect the engine and its accessories daily.

Take note when your engine is hard to start, when it misses or knocks, when it overheats or when it loses power, when you have a smoky exhaust, when it backfires, and when the radiator boils, as all these are definite indications that something is wrong and should be attended to immediately by the operator.

Conclusion

In shovel operation the strong steady pull accomplishes the most work with a minimum of wear on the machine. The shovel's mechanism is tuned and adjusted for smooth unhurried operation; it is foolish to attempt to rush or press its efforts. For the few minutes you might possibly gain, you will pay dearly in worn or broken parts, and in hours lost for repairs, replacements and adjustments. Your problem is to make your shovel last as long as possible, and in the interest of conserving vital equipment, try to anticipate the ravages of stress and wear and forestall them by eternal vigilance backed up by common sense, your grease gun, and your repair kit.

New Load-Bearing Study Of Flexible Pavements

Under the title, "Flexible Pavement Reaction Under Field Load Bearing Tests", another in its series of research pamphlets has been issued by The Asphalt Institute. Prepared by Prevost Hubbard, Chemical Engineer for the Institute, this new bulletin presents an interesting load-bearing study, including a series of settlement and deflection charts, for use in establishing a true evaluation of both the actual and relative load-carrying capacities of different flexible-pavement designs. The scope of the pamphlet is indicated by its four subheadings: previous field tests confusing; settlement and deflection factors; analysis of initial settlement factor essential; and suggested procedure for making field load-bearing tests.

Copies of this publication, designated as Research Series No. 9, are available without charge direct from The Asphalt Institute, 801 Second Ave., New York City, or from this magazine.

Make Your Plans Now, Fleming Again Urges

Speaking before the Governing and Advisory Boards of the Associated General Contractors of America in Chicago recently, Major General Philip B. Fleming, Administrator, Federal Works Agency, again stressed the importance of making detailed plans and specifications and acquiring right-of-way *now* for the post-war construction program. General Fleming pointed out that while most people, and even state and local officials, recognize that construction must play an important part in the post-war readjustment, it does not seem to be widely understood that construction must be *planned*, that many time-consuming preliminary steps must be taken before anybody is given a job on a construction project.

Measured against the potential need, General Fleming said, very little has been done in the way of this kind of actual preparation. Taking the Federal Government first, we find that $7,750,000,000 worth of construction has been projected. But—$1,333,000,000 worth of this has not yet been completely surveyed, and $3,333,000,000 worth still awaits Congressional authorization, leaving only about $3,000,000,000 worth actually eligible for construction. Of this $3,000,000,000, only $1,500,000,000 has been planned to a point where construction can begin, and even some of this is only partially planned. General Fleming estimates that the amount which could be put under way at short notice adds up to only about $600,000,000. The situation among states and cities isn't much more encouraging.

"What I personally hope to see," General Fleming continued, "is some kind of overall national plan of public works construction which will be capable of management in such a way that it will best supplement the recovery efforts of private business. I think it should consist of thousands of Federal, state, and local projects, the most urgently needed of which will be advanced to the contract-letting stage before the war ends. I think that many projects of a type that can be started and terminated quickly should be included. I think the program should be susceptible of control in such a way that we will not be building public works facilities in a certain place at a time when private business in that area is capable of providing all the jobs necessary, and public construction, instead of aiding recovery, would merely come into competition with private industry for labor and materials. In such a situation, planned projects for that area which can be safely postponed should be deferred until a later time of need."

General Fleming concluded, "We now know that public works construction is a continuing function. I see no reason why plan preparation should not be provided for as a continuing function also, and budgeted as such at all levels of government—Federal, state and local. It is far better that we should be prepared at all times than that we should stagger from one crisis to another, trying to 'get by' on hastily improvised plans that, precisely because of hasty preparation, are so often ill-advised and wasteful of public funds. Plenty of sound legitimate jobs need to be done. Long-deferred maintenance alone presents a post-war challenge of the first magnitude. We need new homes, new schools, new hospitals, new sewer and water systems, and flood-control works. Vast hydro-electric potentials remain to be explored and exploited.

"I hope we can go forward together in building on sound principles a better, a happier and a healthier America."

The round trip of 300 Liberator bombers from their British base to Berlin and home again eats up more than 525,000 gallons of gasoline. Remember—gasoline is ammunition too, so use it wisely.

Safety, Appearance Of Texas Roadsides

(*Continued from page* 21)

at the same time to bond the soil with the roots of the vines.

Still farther south on U. S. 81 there is a triangular intersection where a side road turns west to Buda. In order to preserve the characteristic groups of trees at this intersection, arrangements were made with the property owner to refrain from cutting these trees which, in addition to being a delightful spot on the landscape which south of this point is rather barren, serve as a guide to the traveler to indicate that that section of road is one where caution in the operation of vehicles is necessary. One group of trees veers off to the right with the road to Buda, while another delineates the incoming road from Buda for traffic going south. The line of this latter group is continued on the left-hand side of the road by a third group of trees donated to the state by the property owner.

The effect that trees may have on the operation of a motor vehicle is remarkable, according to Jac Gubbels. He has demonstrated the value of confining the vista to make the motorist more cautious in his driving, but also he found that trees could mislead the driver. In several places in the state there were recurring accidents at points where the road was straight but drivers ran off the road, causing many serious injuries. Taking the attitude that the highway department was responsible for these accidents as they could not be attributed to anything but highway design, a very careful study was made of all the locations. The one feature that marked each location was a straight row of trees veering off from the line of the highway along a property line. These, at night particularly, gave the driver the impression that the highway swung off in that direction and resulted in his driving into the ditch. Each of these conditions has been corrected by planting a mass of trees in front of the straight row to break up the line and in each case the series of accidents ceased.

Attractive Roadsides

The interest that can be instilled into contractors by the activities of a Roadside Division are well known to our readers through the publication of many articles showing the work that has been nominated each year for the Roadside Development Awards of CONTRACTORS AND ENGINEERS MONTHLY. Another angle to this interest was called to our attention on this trip at a bridge over Onion Creek. When this bridge was built, the contractor purchased a small plot of land for his plant, finding that the less expensive method of securing a place for the equipment needed for construction. By the time the bridge was completed he had become quite interested in the work of the Department in improving the roadsides and in the small roadside parks scattered over the state. It happens that water flows in Onion Creek throughout the year, except for four to six weeks, making this stream rather attractive because of the small falls and unusual rock formations near the bridge. The contractor fine-graded the plot of land where his equipment had stood and, having a small stock of cement left over, built a concrete stairway from the highway level down to the river bed so that visitors had ready access to the river level. He presented the plot and stairway to the Texas Highway Department.

Mr. Gubbels has often repeated that roadsides do not stop at the fence line. Unfortunately, finances and responsibilities for work of highway departments must cease at that point, but the influence of well-planned and properly planted roadsides extends far beyond the immediate strip. This has been demonstrated in Texas through the cooperation of numerous property owners in the more barren areas in planting trees over the grazing land on their property to break the landscape and, in the case of several dairy farms, to provide future shade for their stock. In one case adjacent to a dairy was a group of trees which added greatly to the appearance of the roadside landscape, but they were on the property of a man not particularly interested in them except as potential timber, although the tract was small. The owner of the adjacent dairy took it upon himself to interest the owner of the trees in the landscape and the value of his trees to the maintenance of its attractiveness so that the owner voluntarily signed an agreement with the highway department not to cut that group of trees.

Invest in Victory. Buy War Bonds.

New Booklet On Shovels

A new attractively illustrated booklet on Buckeye Clippers has recently been issued by the Buckeye Ditcher Co., Findlay, Ohio. Buckeye Clippers are shown handling dirt on a wide variety of construction jobs, including highways, airports, channel cleaning, sewers, Army projects, and by state and county highway departments. The features of the various models of these shovels are also described and illustrated.

Copies of this booklet "Buckeye Clippers" may be secured by those interested direct from the manufacturer. Just mention CONTRACTORS AND ENGINEERS MONTHLY.

New Grade Separation Relocates Two Routes

(*Continued from page 27*)

42-inch concrete pipe was used on the project for storm water and sewers. Inasmuch as all of this project is in the city of Cincinnati, the dividing lines and reflecting curb were installed by the city according to its own specifications. A groove 12½ inches wide and 2½ inches deep was left along the center of the pavement in which the city inserted its standard white-concrete center line or its standard precast white-concrete reflecting curb.

Personnel

The Brotherton Road and Erie Avenue grade-separation project was started October 8, 1941, and completed in November, 1942. Visintine & Co., of Columbus, Ohio, was the general contractor, with Richter Transfer Co. of Cincinnati, Ohio, handling the excavation and L. R. Geiler Construction Co. of Cincinnati, Ohio, doing the paving and sewer work. The contract for the work was awarded by the Ohio Department of Highways, Hal G. Sours, Director. Arthur Hill was Project Engineer throughout the work.

Keep Excavators Working Theme of New B-E Booklet

Ideas to help you keep your present excavators working and doing more to win the war are found in a new 32-page maintenance booklet just issued by the Bucyrus-Erie Co. Containing no extraneous material, this booklet, attractively illustrated and printed in two colors, is filled with practical experience-tested suggestions on how to maintain maximum excavator production.

More than a hundred brass-tacks tips on the proper operation and care of excavators, regardless of make, are given under the following headings: Old and New Ideas for Short Cuts and Savings; Suggestions for the Boss; Suggestions for the Operator; Adjustments; Keep Lubrication Clean; Lubricate Regularly; Prompt Repairs Save Time, Work, Money; Short Moves Often Dig More Dirt; Keep Power Plant Humming; Shove Up Your Shovel Output; Special Helps to Better Dragline Performance; Hints That Help Increase Crane Output; and Safety First.

Copies of this helpful booklet may be secured from your nearest Bucyrus-Erie distributor, or by writing direct to the Bucyrus-Erie Co., South Milwaukee, Wis., and mentioning this review.

Reclamation Bureau Jobs Speeded Up by Overtime

An executive order signed by the President on July 8 permits the Department of the Interior to make even greater contributions to the war effort. This order suspends the 8-hour law as to laborers and mechanics employed in public works and permits the payment of time and a half for overtime in excess of 8 hours of work. Previously work for these employees was limited to 8 hours and no overtime was permitted. The order applies to the Department's public works on power, irrigation, and other construction in continental United States and its activities in Alaska.

Secretary of the Interior Ickes pointed out that the efficient and speedy accomplishment of the Department's war activities required this change, particularly on such work as the installation of generating units in the Bureau of Reclamation's power plants to meet schedules set by the WPB, and is of equal importance to the irrigation projects for the war food program. It also applies to the construction of transmission lines by the Bonneville Power Administration, work of other agencies of the Department on the mainland, and the Division of Territories in Alaska.

There is a real message for you in the editorial on page 4. Don't miss it!

STATE MAINTENANCE COST AS PER CENT OF STATE CONSTRUCTION AND MAINTENANCE EXPENDITURES

State	1931-34	1935-38	1939-42	State	1931-34	1935-38	1939-42
Alabama	23.5	17.6	23.0	Nevada	14.0	19.5	22.7
Arizona	20.1	22.3	24.3	New Hampshire	51.6	52.1	54.5
Arkansas	23.3	38.8	44.6	New Jersey	10.3	25.8	26.7
California	19.5	24.9	29.4	New Mexico	23.2	19.7	28.4
Colorado	19.4	12.1	17.8	New York	19.9	19.9	24.0
Connecticut	27.8	25.1	20.8	North Carolina	38.6	58.3	71.7
Delaware	12.3	35.9	30.5	North Dakota	23.2	31.4	32.9
Florida	25.4	32.1	23.6	Ohio	36.4	47.5	38.9
Georgia	12.9	10.9	11.0	Oklahoma	18.2	21.2	28.0
Idaho	21.5	23.1	27.7	Oregon	22.6	27.8	34.7
Illinois	14.0	21.3	29.0	Pennsylvania	34.1	56.4	35.1
Indiana	24.6	25.2	30.2	Rhode Island	37.5	36.9	39.1
Iowa	16.3	24.5	27.5	South Carolina	14.7	22.1	27.8
Kansas	27.7	28.2	33.2	South Dakota	24.3	23.6	30.5
Kentucky	25.9	39.6	32.1	Tennessee	21.6	26.3	25.7
Louisiana	15.7	26.5	32.0	Texas	26.2	24.2	28.5
Maine	30.6	39.2	48.0	Utah	25.7	30.9	27.4
Maryland	20.7	24.5	17.7	Vermont	31.5	36.5	41.6
Massachusetts	29.8	30.1	42.4	Virginia	41.5	39.8	23.1
Michigan	25.2	26.4	30.5	Washington	22.0	23.4	28.5
Minnesota	23.9	29.4	32.5	West Virginia	31.8	40.6	43.5
Mississippi	29.0	12.1	11.3	Wisconsin	23.7	30.8	34.8
Missouri	15.7	23.9	35.5	Wyoming	16.7	17.1	20.3
Montana	16.7	25.0	32.1				
Nebraska	24.8	27.4	27.7	Average	23.9	29.8	31.2

Highway Maintenance—Is Its Cost Increasing?

In the hearings before the House of Representatives Committee on Roads on H. R. 2113, the bill to amend the Federal Highway Act, Thomas H. MacDonald, Commissioner, Public Roads Administration, presented some interesting figures on state highway maintenance costs during the past 10 years. These figures, given in the accompanying table, show that the average state maintenance costs, in percentage of state construction and maintenance expenditures, has risen from 23.9 in the 4-year period 1931-34 to 31.2 in the period 1939-42.

In presenting these figures, Mr. MacDonald pointed out that while we are getting an accelerated depreciation of our roads now, we have not been keeping up with our needed reconstruction and replacements. This began to be apparent in the period from 1935 to 1938.

A.S.T.M. Annual Meeting

With a registered attendance of 1,452 members, committee members, and guests, and 245 technical committee meetings at each of which there was an excellent attendance of members, the Forty-Sixth Annual Meeting of the American Society for Testing Materials, held in Pittsburgh June 28 through July 1, had the third highest attendance ever recorded at a meeting, exceeded only by the 1937 meeting in New York and the 1941 meeting in Chicago.

Many important actions on standards and discussion on results of numerous research investigations featured both the formal technical sessions and the committee meetings. At no previous annual meeting has there been greater interest in technical work.

Continued intensive interest in many of the problems in the field of cement, concrete, and concrete aggregates was evident from the two technical sessions devoted to these subjects. In addition to reports of Committee C-1 on Cement and C-7 on Lime, the session featured five technical papers, and there were also five papers at the closing session on concrete.

Information on the reports of these various committees may be secured by those interested direct from the American Society for Testing Materials, 260 So. Broad St., Philadelphia, Pa.

Vibrating Equipment

Catalog No. 750, covering the complete line of Jeffrey-Traylor electric vibrating equipment for solving many materials-handling operations, is just off the press. A glance through this 176-page book provides a good idea of the scope and versatility of these vibrating units, and a careful study will prove helpful in suggesting the solution of many feeding, conveying, screening, and similar applications.

Copies of Catalog No. 750 may be secured by interested contractors and engineers direct from the Jeffrey Mfg. Co., Columbus, Ohio, by mentioning this review.

CONTRACTORS AND ENGINEERS MONTHLY
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Enclosed is my remittance of $2 for the next twelve issues of CONTRACTORS AND ENGINEERS MONTHLY.

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A New Jersey State Highway Department Mud-Jack crew raising concrete slabs for safety at a traffic circle near New Brunswick on N. J. State Route S-28.

Mud-Jacking Raises N. J. Traffic Circle

(*Continued from page* 1)

confronted was that of making this traffic circle safer for vehicular traffic. The difficulty lay, not in basic design, but in the fact that motor freight carriers are inclined to exceed rational speed limits, with the result that the centrifugal overturning movement to be counteracted, particularly in the case of heavy truck and trailer traffic, was pronounced.

This traffic circle has a radius of 120 feet. The pavement consists of three 10-foot lanes, with an ordinary crown and with roadway drainage both ways from the center line to collecting units. The northbound, or Trenton-to-New York, traffic was most affected because of a more sharply accentuated lateral gradient. Although a separate roadway was recommended as a solution to the problem, it was finally decided to super-elevate the northbound roadway in order to eliminate costly accidents affecting the war effort. This super-elevation amounted to a maximum of 24½ inches down to zero at a distance of 200 feet.

Procedure

Holes 2¾ inches in diameter were drilled through the 9-inch reinforced-concrete pavement about 30 inches from the edge of the 10-foot slab and spotted 7 to 8 feet longitudinally. Approximately ten holes were drilled in each slab, which averaged about 35 feet in length. By means of 2⅝-inch hose and reinforced metal nozzles, "mud" was forced through these holes. This mixture was made up of about 1 part of cement to 7 parts of a carefully selected non-sandy loam, and was brought to a good pumping consistency by the addition of about 4 gallons of water per bag of cement.

A pugmill piston-type Mud-Jack, operating at about 17 strokes a minute, forced this mud under the concrete slab at a maximum rate of 35 cubic yards per 8-hour day at 2 to 4-pounds pressure per square inch. To prevent the mud from escaping through adjacent drill holes, a wooden plug was driven tightly into those drill holes not being pumped.

Under traffic densities of as high as 18,140 vehicles a day encountered on this job, it was necessary that these operations be carefully organized. A concrete slab cannot be raised 24 inches with 1 to 7 mixture of mud in one operation, but the procedure had to be graduated, particularly when the inside of the rotary must be kept at zero. However, operations proceeded on schedule, and the work was brought to a successful completion.

It should be noted that the fluidity of the mud is of vast importance. A sandy sub-base creates an entirely different set of problems from those presented by a highly clayey sub-base, inasmuch as the latter type of base does not absorb moisture readily, while a sandy sub-base takes up much of the moisture almost immediately, thus reducing the fluidity of the mud.

Costs

The personnel required for work of this kind is usually 15 to 18 men, depending upon the source of the topsoil and the type of work being undertaken. Generally five men will suffice for handling the topsoil, five men around the Mud-Jack, a trio of skilled operators, two truck drivers, and the foreman and his lead man. Under average conditions the costs amount to about $125 a day.

In New Jersey, the cost of Mud-Jacking has increased from 10 cents per square yard per inch of raise to approximately 25 to 30 cents per square yard per inch of raise, due to the increased cost of both skilled and unskilled labor, the difficulty of securing suitable topsoil in New Jersey, and the increase in motor-vehicle traffic. However, experience shows that it is well worth the cost.

Mud-Jacking costs for the work performed at the New Brunswick traffic circle have not been definitely fixed, as many other features of the work at that point could not be charged to Mud-Jacking. Present indications are, however, that the total cost of the improvement can well be justified.

New Jersey has used its Mud-Jack on a number of highway improvement projects with very satisfactory results. The maximum amount of work accomplished in one 10-hour day was on N. J. Route S-41, where fifteen 10-foot reinforced-concrete slabs 9 inches deep and 35 feet long and weighing approximately 22 tons each were raised 4 inches.

Start designs now for post-war work. No plans now—no jobs later.

Atkins-Hassler Electric Tree Fallers mounted on a Caterpillar tractor.

New Electric Saws For Felling Trees

Speed and ease in felling and bucking trees in land-clearing operations are two of the feaures of the Atkins-Hassler Electric Tree Faller. Adapted to felling and cross-cutting all types of timber, as well as removing large limbs, this saw cuts through an average 30-inch diameter soft-wood log in 60 seconds, it is reported, and will cut either straight across the grain or at an angle, which allows for making any type of undercut desired.

The use of high-cycle energy makes possible operation on a 10-hp motor weighing only 32 pounds. All moving parts are dynamically balanced at a speed of 20,000 rpm, to assure vibration-less operation. The cutter chain tightener and outer handle assembly is of special patented design, to assure even tension on the cutter chain at all times. The collapsible handle permits easy removal of the entire assembly from the cutter bar, allowing the bar and chain to be withdrawn from a cut, if desired, without parting the chain. The manufacturer states that the chain cuts free, and it is unnecessary to rock the saw to make it cut. Very little pressure is necessary on the part of the operator, which not only decreases fatigue but also adds to the life of the chain and bar, since very little pressure is exerted by the chain on the bar and less lubrication is required.

Generators for operating these saws can be mounted on tractors, driven by a power take-off, or on skids or other units and driven by gasoline or diesel engines. Any number of saws can be operated by one generator, depending on its size, and the manufacturer says that there is practically no limit to the distance from the generator that the saws can operate. It is suggested that where conditions are favorable to the operation of a tractor, this type of mounting be used, and the saws can also be carried on the tractor when not in use, as shown in the illustration.

Further information on these lightweight Electric Tree Fallers is contained in a folder, copies of which may be secured direct from E. C. Atkins & Co., 402 So. Illinois St., Indianapolis, Ind., by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

New Line Of Motors For Pumping Service

A new line of direct-current vertical motors ranging from 40 to 200 hp at 1,750 rpm, and in equivalent ratings at other speeds, has been announced by the General Electric Co., Schenectady, N. Y. The new motors, which are furnished for both constant and adjustable speeds, are designed for low-thrust solid-shaft applications on pumps, machine tools, and other specialized services. They are also desirable in cases where valuable floor space must be saved or the expense of gearing avoided.

The motors are of drip-proof protected construction, and convenient fittings on both the upper and lower bearing simplify lubrication. The provision for the escape of excessive grease reduces the possibility of over-lubrication. A special bearing housing prevents grease from entering the motor and damaging the commutator and the windings.

The cast-iron conduit box is roomy and can be arranged for bringing the leads in at the top, bottom, or either side. Two hand-hole covers, removable without the use of tools, permit quick and easy inspection of the commutator end brushes. The ring-type base has an accurately machined rabbet and jig-drilled mounting holes, thus assuring permanent alignment with the driven machine. Sturdy lifting lugs facilitate installation.

Further information and prices may be secured direct from General Electric by referring to this item.

Kentucky Plans $20,000,000 Post-War Highway Program

Kentucky has now completed, or has in process of completion, plans for more than $30,000,000 worth of public works projects to aid in the solution of a post-war unemployment problem, of which the largest single item is a $20,000,000 highway and bridge program, according to a recent report in *The Scraper*. Most of these projects, which are somewhat apart and separate from the regular highway construction program, are located in and around towns where unemployment is believed most likely to be a serious problem.

Preliminary surveys, plans and specifications for this $20,000,000 highway program have been completed, or are nearly completed, and are being financed by a joint Federal-State appropriation of $280,000 for the specific objective of cushioning post-war employment. The work planned, which has not been authorized or even decided upon definitely, includes improvement of existing routes, several alternate highways for heavily traveled routes, belt lines around both Louisville and Paducah to connect all routes entering each city, and several by-passes.

Indian Handicraft Saves Drainage Job In Central America

A cement shortage in El Salvador threatened to bring to a standstill a modern malaria-control project, but the work was continued under the direction of local and United States engineers by turning to an ancient Indian handicraft. Last July extensive malaria-control operations were undertaken by the Servicio Cooperativo Inter-Americana de Salud Publica, the agency set up by the government to cooperate with the United States in health and sanitation work. This project provided for a large-scale drainage installation of concrete-lined ditches around the city of San Miguel to eliminate breeding places for malaria-carrying mosquitoes. More than 3 miles of ditches were completed when the job was faced with a shortage of cement. In view of the shipping situation, a delay of an indefinite period seemed likely.

The attention of the engineers was called to a little shop in San Miguel which manufactured tilings and other clay products. In this shop the same method of molding clay with a mixture of sand, white earth, and water was being used as when the Spaniards found the Indians working in this locality more than four hundred years ago. The engineers decided to experiment with the clay product in the manufacture of inverts and backings for the ditches. The local craftsmen, under the direction of the engineers, made wooden molds in the pattern of the cement product.

Experiments were continued for about six weeks. At first the adhesive qualities of the clay product were found to be faulty, but after experimentation, this defect was remedied with the use of a locally-produced adhesive material. The little factory plans to turn out as many as forty inverts daily of the clay product, utilizing exactly the same process that the Indians used hundreds of years ago. This process calls for the molded product to be placed for six days in the shade, followed by four days in the sun, and then baking in an oven for eighteen consecutive hours.

The clay, sand, and white earth are plentiful throughout Central America, where extensive Inter-American malaria-control operations are under way in six countries. This rediscovered process will do much to relieve the wartime shortage of cement which has threatened at times to slow up the malaria-control work.

Construction of Dam In Utah Authorized

The Bureau of Reclamation has been authorized to construct the Scofield Project in Carbon County, Utah, for irrigation and flood-control purposes, and work will start as soon as the necessary legal matters are completed, Acting Commissioner Harry W. Bashore of the Bureau of Reclamation has announced. Critical materials have been released and funds made available for construction. The project will replace existing Scofield Dam, built by private interests in 1926-27, to avert a total failure of the badly deteriorated structure during a sudden flood. Vital parts of the old dam have collapsed and it is a constant threat to the safety of farms, industries and lives below it.

In addition to alleviating a critical condition, the new Scofield Dam will provide about 73,000 acre-feet of storage which will stabilize the water supply of 12,500 acres of irrigated lands of the Price River Valley, now faced with shortages, and form the basis for providing supplemental water to the nearby Gooseberry Project of 30,000 acres when that project is authorized. The dam will be an earth-fill structure 420 feet long, 56 feet above the stream channel, with a crest width of 30 feet, and will be constructed just below the existing unsafe dam. The total estimated construction cost of the project is $640,000.

Failure of the present dam would release 30,000 acre-feet or 10,000,000,000 gallons of water which would do great damage to mines, war industries and railroads, endanger the lives of hundreds of people, and cut off all irrigation water for 12,500 acres of rich agricultural land producing essential food crops.

A Clear Compound For Curing Concrete

At present the most generally used method of concrete curing is the impervious membrane type of compound which is sprayed onto the fresh concrete and then left, eliminating the labor and time required for continual wetting during the curing period. One of these transparent membrane curing compounds is Hunt Process-Clear, a carefully proportioned blend of oils and waxes in a petroleum solvent which seals and adheres to a concrete surface without affecting the natural color of the concrete. Containing a quick-fading dye to aid in complete and uniform coverage and to prevent waste in applying, Hunt Process-Clear dries rapidly, forming a film of uniform texture over the concrete. It is equally adaptable for curing concrete pavements, bridges, dams, retaining walls, or any type of concrete structure.

Advantages claimed by its maker, the Hunt Process Co., 7012 Stanford Ave., Los Angeles, Calif., include full strength of concrete throughout the mass; an impervious film which is not sticky or greasy but which adheres to the surface without reacting with the concrete; the original mixing water is sealed in; the elimination of hair checking, scaling and dusting; the prevention of damage to concrete by rainfall; the acceleration of the setting of the concrete in cool weather by eliminating the cooling action of evaporation and utilizing the heat of hydration; and its easy application by either hand or power spray equipment.

Under practically all conditions, Hunt Process-Clear can be applied in one coat resulting in complete curing. On concrete slabs with a rough broom finish, one gallon is required for about 250 square feet; for a troweled finish, a gallon serves for from 300 to 350 square feet, while for mass concrete in steel or pressed board forms, one gallon covers 300 square feet. Under very hot atmospheric conditions, it is advisable to apply two coats on sharply sloping or vertical smooth-textured surfaces. In such circumstances, the average coverage should be approximately 50 square feet less per gallon.

A folder containing further information on Hunt Process-Clear, which has been used on Federal, state and county, and municipal construction and in irrigation work west of the Mississippi where the Hunt Process Co. operates, may be secured direct from the manufacturer by referring to this item.

Change of Address

(Mail to Contractors and Engineers Monthly, 470 4th Ave., New York 16, *today*)

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Concreting operations for one of the reinforced-concrete ships being built by Barrett & Hilp at the Belair Shipyard.

Production Methods For Concrete Barges

(*Continued from page 7*)

like a ship to reduce resistance to a minimum, is divided into holds by transverse bulkheads, and will have cabin quarters for a crew of ten men. Diesel engines will be installed for the anchor windlass, towing machine, pumps and generators. Each ship contains 2,400 cubic yards of concrete and 1,400 tons of reinforcing steel. A steel ship of similar proportions would require 2,500 tons of steel, and reinforcing steel was more readily available because mills making bars cannot run steel plate.

Outside forms for the hull were constructed in the six concreting docks and are of plywood mounted on scaffolding. These are removed with the completion of each barge and reset as construction starts on the next vessel. Inside forms are sectional, and are also re-used. These sectional forms for the bulkheads, decks, ribs, and other details were constructed from templates in the mold loft.

Butt-welded reinforcing rods, 350 feet long and 1¼ inches in diameter, run the entire length of the ship in bilges and at deck level. Much of the steel reinforcing is prefabricated in large sections in the yard and then moved to the hull by transit cranes.

The concrete is placed in three pours, the first filling the bottoms and bilges to a height of 8.1 feet. The second pour carries the hull and bulkheads up to a level just below the decks, and the third completes the deck, rails and deck girders. Each pour requires 800 cubic yards of concrete and is a continuous operation. All concrete is vibrated in place.

The use of Haydite, a light-weight but strong aggregate, in the concrete makes it possible to produce a wall 6 inches thick, with adequate strength and density, in contrast to the 1-foot thick hulls of the concrete ships built in World War I.

Personnel

The contract for the construction of the Belair Shipyard and 26 of these ship-shaped reinforced-concrete barges was awarded by the U. S. Maritime Commission to Barrett & Hilp, for whom George McKeever is General Superintendent and William R. Lawson is Project Manager. The original design for these barges was made by Maritime Commission engineers. Joslyn & Ryan of San Francisco are the naval architects and Ellison & King, also of San Francisco, the structural engineers.

Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

Refund of Taxes on Gas Not Used on Highways

A dike construction company lost a suit before the Iowa Supreme Court to secure a refund of taxes paid on gasoline used in operating tractors, boats, floats, etc., none of it having been used in operating vehicles on highways.

The Iowa statutes, like those of many other states, provide for refunding taxes on gasoline not consumed in operations on highways, for the upkeep of which the tax is levied. But the Iowa statute has this proviso tacked to it: "No tax refund shall be paid * * * on any motor vehicle fuel used in any construction or maintenance work which is *paid for out of public funds.*" It was unsuccessfully argued on behalf of the construction company that the proviso should not be construed to prevent a refund in the case of work on Federal projects, such as was the one in question. It was not denied that the state could require contractors on such jobs to pay a gas tax, but was argued that the exception should not be held to prevent a refund. Said the Supreme Court (Wood Bros. Const. Co. v. Bagley, 6 N. W. 2d, 397):

"Had the legislature intended that there should be a refund as to Federal construction, it could easily have so specified. * * * But as it stands it is our opinion that it applies not only to public funds of the state but also to all subdivisions or to any public funds whatsoever, including Federal funds."

Effect of Cashing A Check "In Full"

It is not true, as commonly supposed, that a debtor, by merely offering his creditor a check as full settlement of what he owes, can put the latter in a "hole" where he must choose between accepting the check as final payment and rejecting it. *If there is no bona fide dispute as to the amount that is owing,* the creditor can cash the check and sue for the balance actually due, despite the condition attached by the debtor. It is true that by cashing the check, the creditor *agrees* that he will accept it as final settlement, and often circumstances may make it expedient not to cash the check.

But if the creditor can show that there was no reason for the debtor questioning the amount due from him, the debtor cannot wiggle out of part of the debt by inducing the creditor to accept a check for less. The theory of the law on this point is that no agreement is binding unless it is supported by a consideration, and that a mere agreement by a creditor to accept less than what is *actually* and *indisputably* due is not supported by a consideration. (But, of course, a creditor can bind himself by an agreement to accept a *secured* note in satisfaction of an *unsecured* debt for a larger sum.)

Where there is a bona fide dispute, acceptance of the check is a final settlement. For example, in the case of Commonwealth v. Breslin Construction Co., 165 S. W. 2d, 809, letters to the company from engineers of the state highway department indicated that the company would be held responsible for delays in furnishing road materials to the department. Under these circumstances the Kentucky Court of Appeals decided that there was a bona fide dispute as to whether or not the Commonwealth had a valid counterclaim against the company on account of the delays, and that the company's cashing of a check "in full" prevented collection of anything more by suit.

Concealed Defects

We often speak humorously of a doctor's mistakes being buried. The law reports attest that doctors do not have a monopoly in opportunity to conceal neglect. Frequently we hear of contractors who have been called to account in court for having slighted specifications calling for construction involving concealed features.

One consequence of unexcused departure from specifications is shown by the result of the case of Russo v. Charles I. Hosmer, Inc., 44 N. E. 2d, 641. There a subcontractor agreed to furnish and erect 1,505 concrete highway guard-rail posts, each reinforced by four steel rods. After they were erected, twelve of the posts were tested and found to contain but two rods. These were replaced and the job was accepted, but it was later discovered that the other posts furnished were also deficient in rods.

Under the circumstances, the Massachusetts Supreme Judicial Court decided that the subcontractor was not entitled to recover a balance due on the contract. The court applied the fundamental rule of law that a contract price cannot be collected in full unless there has been strict performance of the contract. (Where there is an honest attempt to perform strictly, and there are only slight deviations for which allowance can be made through deduction from the contract price, the balance may be recovered.) Here the court found that omission of rods from the posts was wholly inexcusable, and that there was no waiver of the defects, because neither the general contractor nor the Commonwealth, for whom the work was done, knew that the posts contained less than four rods each.

Extent of Authority Of Job Superintendent

No doubt every one knows that when a contractor hires a day laborer to work on a job, the laborer does not in any sense become an agent of the company in the matter of buying materials or equipment. Equally widespread is the understanding that the contractor's general agent does possess that purchasing power, on the credit of the contractor. But in between the day laborer and the general manager are often a host of agents and employees of the contractor, the scope of whose authority to bind the contractor is not always clear.

In a Louisiana case, it appeared that the superintendent of a highway bridge job had agreed to buy certain materials from a lumber company, but the authority of the superintendent to bind the contractor was questioned. The Louisiana Supreme Court intimated that the mere fact of his position as job superintendent did not give him implied power to make material purchases. But the court ruled that since he had made previous purchases of materials for which the contractor paid without repudiating the superintendent's authority, the conclusion was warranted that the superintendent did not exceed his powers in buying from the lumber company. Said the court: "The agreement entered into by the job superintendent was most conducive to the interest of the contractor under the circumstances. The 'lumber company' had the right to rely on the authority of the superintendent to enter into such a contract because the superintendent had purchased many materials from it and others with the apparent approval of the contractor." (Louisiana Highway Commission v. McCain, 1 So. 2d, 545.)

INDEX TO ADVERTISING

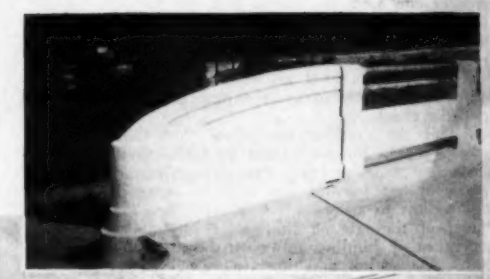
Contractors and Engineers Monthly

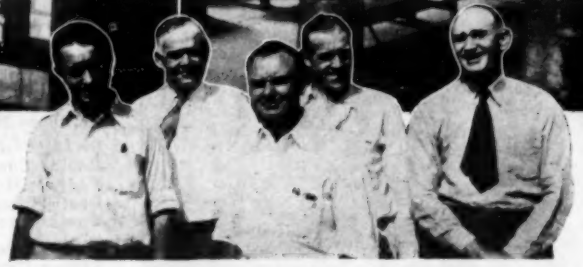
C. & E. M. Photos

The 3-foot widening strip on Scully Bros. contract in Hamilton and Clermont Counties, Ohio. Note the line of steel road forms and insulation layer of stone dust in the photo at the left; the careful bracing of the forms in the photo at the right; and, below, the rolling of the bottom course of the hot-mix in the widening strip. See page 9.

The concrete mixer and water pump in place, ready to pour the 2-foot concrete deck for Chickahominy Dam to impound 1,500,000,000 gallons of water to supply the Newport News, Virginia, area. See page 13.

The 50-foot span over a drainage ditch in Ada County, Idaho, shown at right, collapsed under the load of a large crawler tractor and was replaced by the 29-foot-span creosoted-timber structure below. All work was done by the county bridge crew. See page 2.





C. & E. M. Photos

Above, a section of the stock room in the Headquarters Garage of the Missouri State Highway Department, where 5,000 different items valued at $250,000 are maintained, and at right, a part of the machine shop. The group at the right includes, from left to right, Fred Heckel, Chief Mechanic; R. P. Cummins, Superintendent of Equipment; D. W. Campbell, Superintendent of the HQ garage; H. B. Rice, Garage Clerk; and L. M. Hoskins, Associate Engineer of Construction. See page 2.

C. & E. M. Photos

General view of the Red Bank Road Bridge, a 156-foot 6-inch reinforced-concrete structure, one of three in a single project providing safer access to the Cincinnati, Ohio, industrial area from residential sections. Inset, a detail of the end of the concrete hand-rail on the Red Bank Road Bridge. See page 27.

Power graders with spreader boxes attached in front are used to apply the chip seal on Colorado highways. A truck is shown loading one of these boxes and, at the far right, the chip seal is being applied. See page 15.

Colorado State Highway Dept. Photos